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National Economic

Development Procedures

Manual - Recreation

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Volume II

A Guide for Using the
Contingent Value Methodology
in Recreation Studies

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20 ABSTRACT (Continue on reverse side if necessary and identify by block number) This report is designed to assist Corps planners in using the contingent value method (CVM) for the economic evaluation of NED recreation benefits. CVM along with the travel cost method (TCM) are the techniques recommended in Principles and Guidelines for evaluating the economic benefits from the recreational components of Federal water resources investments. For the preparation of this manual, CVM was applied to three case studies of actual Corps District recreation projects. These case studies proved invaluable to understanding the

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advantages, weakness, difficulties, and potential pitfalls of the CVM. In addition, the case studies provided the basic information presented in the examples used in this report.

The chapters of this report are arranged in the basic order necessary to conduct a CVM analysis. Chapter I covers the concepts and background of CVM as an economic evaluation techniques. Succeeding chapters cover the basic areas of: sampling; questionnaire design; survey design (including estimates of survey costs); data analysis procedures and techniques; and, the evaluation of NED benefits. Several examples are used to illuminate the basic process required to correctly apply CVM. Included as an appendix is the list of CVM questionnaires approved by OMB for Corps planning purposes.

NATIONAL ECONOMIC DEVELOPMENT PROCEDURES MANUAL - RECREATION

Volume II

A Guide for Using the Contingent Value
Methodology in Recreation Studies

by

David A. Moser, Ph.D
C. Mark Dunning, Ph.D

U.S. Army Corps of Engineers
Water Resources Support Center
Institute for Water Resources
Fort Belvoir, Virginia   22060-5586

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Chapter I

CONCEPTS IN THE CONTINGENT VALUE METHOD

FOR VALUING RECREATION BENEFITS

Introduction

The basic concept employed for evaluating all economic benefits from water resource investments is the willingness-to-pay (WTP) principle. Benefits are the maximum amount that individuals are willing to pay rather than go without the goods and services produced by the investment. For marketed goods, this is the amount actually paid to obtain the good plus an additional amount an individual would be willing to pay for the right to purchase the chosen quantity of the good at the market price. This latter monetary amount is generally referred to as the consumer's surplus and represents the value of the quantity of the good purchased by the consumer, over and above the amount actually paid. Therefore, changes in consumer's surplus are considered as welfare gains to the consumer because this extra value is obtained without charge.

If markets existed for the goods and services produced by water resources investments, individuals would reveal their WTP through the market demand curve. The market demand curves for these goods and services could then be used to measure benefits. Figure I-1 shows a demand curve for a particular

good; if the price of the good is $5 per unit, consumers are willing to purchase 50 units of the good. The total value of
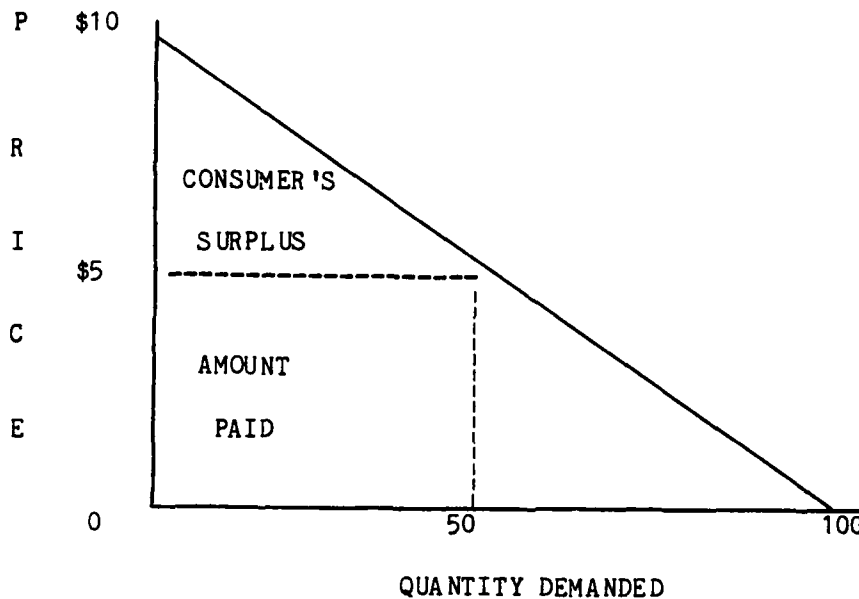
Figure I-1: The Market Demand and Consumer's Surplus

these 50 units to the consumers is the area under the demand between a quantity of 0 and 50 units. The difference between the amount they must pay for the 50 units, $250, and the total value to them of the 50 units, is the consumer's surplus: consumer's surplus equals $125 in this example. If Figure I-1 represented the demand curve for a new good produced by a water resources investment, the total benefits would be the dollar amount the consumers pay for the 50 units, $250, plus the consumer's surplus, $125, so that benefits would be $375.

Conceptually, a recreational facility has a demand curve analogous to that of a marketed good. For many of the recreation outputs of Federal water resources projects, however, the goods and services are provided without

charging a price. This means we have no direct means to determine the value, i.e., the WTP of these investments. Additionally, it has been recognized in recent years that users of recreational sites may not be the only beneficiaries. Non-users may also derive benefits from a site because they may want to use it in the future or because they benefit from simply knowing that the site exists. These two sources of benefits, known as option value and existence value, respectively, may figure prominently in the estimation of recreation and related benefits. A recent study by Desvousges, Smith, and McGivney (1983) of the value of water quality improvements along the Monongahela River concluded that the option value from water quality improvements exceeded the corresponding user value. Therefore, omitting option and existence values in the estimates of recreation benefits may result in an understatement of the true economic value of a recreational opportunity. The contingent value method (CVM) allows the simulation of a market for the nonmarketed recreational outputs of water resources projects. In addition, the intrinsic option and existence values can also be evaluated.

The Contingent Value Approach

The contingent value method is an expressed preference approach that directly asks individuals to state their preferences among alternatives, primarily through actual or hypothetical payments. Variations in the approach include personal interviews and mail questionnaires, bidding games and public participation through referenda, hearings and public meetings.

Contingent value methods assume that individuals know the value to them of the good or service being asked about in the questionnaire. The methods also assume that a hypothetical market can be described so that the respondents react to the CV market in the same way as they would a real market. Thus, an ideal CV questionnaire would present respondents with a believable market that encourages realistic and nonstrategic responses.

One significant design issue in all survey methods is the significance of bias in the survey responses. The existence of bias in CV surveys implies that tsample WTP estimates systematically diverge from the "true" WTP. In addition to the possibility of sampling bias, six potential sources of bias have been identified in the literature. The survey instrument should be designed to avoid these biases and to allow checks for the existence of possible bias. Although the biases are presented as if they are neatly compartmentalized, the boundaries between the biases tend to be blurred: one analyst's hypothetical bias is another's strategic bias.

Types of Bias

1.   Hypothetical Bias.

This type of bias is attributable to the use of a hypothetical rather than a real market situation. In this case, the respondents either cannot or will not treat the hypothetical market as they would an actual situation. If hypothetical bias exists, the respondents may refuse to participate in the CV experiment. When this bias is present in a CV

experiment, the effect is to increase the statistical variance and to lessen the reliability of the estimated WTP amounts. The extent of this bias can be reduced by making the hypothetical market as believable as possible.

2.   Strategic Bias.

Responses to CV questions may elicit strategic behavior on the part of respondents if the perceived consequences of the experiment influence the stated valuations of the respondents. Strategic bias may affect the experimental responses in two ways. Respondents may understate the value of the good to them if they believe that the experimental results will be used to establish a price for the good, provided the individual is reasonably sure that the good will be provided. Alternatively, respondents may overstate the value if they believe that this will positively influence the provision of the good, provided they also believe they will not have to pay based on this ʟuation.

The empirical evidence on strategic bias in CV experiments has generally shown that strategic behavior is not a major problem.[1] It may be a problem, however, if the questionnaire is not designed to reduce the perceived consequences of the experiment. Significantly, the concern over strategic bias assumes that the respondent knows the true value of the good to him to be

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[1]For example: Brookshire, David S., B. Ives, and William Schulze, "The Valuation of Aesthetic Preferences," Journal of Environmental Economics and Management," Dec., 1976, pp. 325-46; Rowe, Robert, Ralph C. d'Arge, and David S. Brookshire, "An Experiment on the Economic Value of Visibility," Journal of Environmental Econmics and Management, March, 1980, pp. 1-19.

able to behave strategically. Therefore, a properly constructed questionnaire should be able to elicit accurate WTP values.

3. Payment Vehicle Bias.

Payment vehicle bias can occur if the respondent is influenced by the method of payment used in the CV experiment. Several payment vehicles have been used in past experiments including: user fees, increases in utility bills, higher consumer prices, and higher taxes. Care must be taken in choosing the payment vehicle to make it as realistic and familiar to the respondent as possible. A problem with these payment vehicles, particularly taxes, is that they may lead to a rejection of the payment vehicle, emotional responses and protest bids. These payment vehicles should be avoided.

4. Starting Point Bias.

The starting point is the initial valuation in a bidding game: this value may influence the final bid. Therefore, tests for starting point bias should be included in the research design by using multiple starting points. The WTP bids can then be adjusted if starting point bias is shown to be a problem.

5. Information Bias.

Information bias may exist if the respondent is influenced by the amount of information given to him. The CV literature provides little

evidence on the extent of this possible source of bias. The likelihood of experiencing this bias can be minimized by careful questionnaire design and thorough interviewer training.

6. Interviewer Bias.

Interviewer bias refers to the ability of interviewers to influence respondents' answers. Some interviewers will be neutral while others can consciously or unconsciously influence the respondents' valuations. The likelihood of interviewer bias can be reduced with interviewer training sessions and by using experienced professional interviewers. Even so, the research should examine the experimental results to determine the influence of different interviewers.

Despite the potential problems described above, the contingent value approach is emerging as the most often employed means to estimate the value of a wide variety of nonmarket values. A significant advantage of the CV method in recreational planning is that it provides a means to measure the value of recreational outputs that are currently not available. In addition, the CV method represents the only acceptable approach to valuing output in some instances.

The remainder of this manual describes the process of the contingent value method. Chapter II discusses basic survey design and sampling techniques applicable not only to CV studies but also to other survey methods. Chapter III describes the considerations and approaches to the development of

the CV survey questionnaire. Interviewing and other data collection

techniques are discussed in Chapter IV. Chapters V, VI, and VII cover the

areas of data analysis from raw data editing to estimating NED benefits.

Throughout the succeeding chapters, practical knowledge gained from three CV

case studies will be used to illustrate the various problems and their

solutions.

Chapter II

SAMPLING FOR CONTINGENT VALUE ESTIMATES

Introduction

In most instances it will not be feasible to administer CV questionnaires to all those individuals who might have a WTP for an amenity. There may be simply too many individuals, as where a market area for a recreational area encompasses a large city. Or, a group of potential users for a recreational facility might be widely separated by distance as when fishermen may come from long distances to experience a particular kind of fishing opportunity. In such instances it becomes necessary to select a sub-set of individuals and draw conclusions about the entire set of individuals' willingness to pay. The process of selecting the sub-set of individuals is known as sampling.

In this user manual sampling refers only to random or probability samples. In this form of sampling each unit selected for the sample has a known probability of being selected. By insuring that this criterion is met, estimates of error associated with the representativeness of the sample to the population can be assessed. There are other sampling methods which have been used to try to achieve representative samples. These methods include judgement sampling and quota sampling; however, since these methods do not rely on probability theory no estimates of accuracy concerning the representativeness of the sample can be made. The use of such non-probability sampling techniques is not encouraged.

Modern sampling techniques allow refined estimates about population characteristics to be made from surprisingly small sub-sets. However, it is also true that substantial errors in estimating population characteristics have been made on the basis of ill-conceived or poorly executed samples. It is therefore important that those planning a CV survey be familiar with fundamental concepts of sampling in order to insure that the estimates of WTP obtained from their surveys are credible. This chapter presents these concepts and discusses several issues which must be addressed in developing efficient and representative samples for CV estimates.

Measurement of Error in Samples

A central strength of modern probability sampling is the ability to guage how much error is associated with a given population estimate. Being able to estimate error associated with the sample value in turn provides information on how reliable the sample value is - and how much confidence can be placed in the CV esitmates obtained. In order to develop these estimates of sample error several key statistics are used. These will be presented in this section in the context of a CV example.

Example:

The WTP of boaters to launch boats at a proposed marina is needed to compute benefits. A population of 1200 boaters has been identified and a simple random sample of 235 boaters has been taken. Upon tabulation of responses it is determined that the average WTP to launch boats at the marina is $241.00 per boater per year.

A point estimate of WTP for the entire population of boaters has now been obtained from this sample. The question that then arises is how confident we are that this value accurately represents the average WTP which would have been obtained if the entire population of 1200 boaters had been surveyed. If the sample had been drawn using a non-probability approach (e.g. using a quota sample) it would be impossible to respond to this question. However, since a probability sample approach was used we can provide estimates of how closely the sample WTP is likely to approximate the true WTP of the population.

To accomplish this estimation of error it is necessary to look at the dispersion of WTP bids around the sample mean. Two statistics which describe this dispersion are the variance and standard deviation.

The formula for the variance is:

$$(2.1) \quad s^2 = \frac{(y-\bar{y})^2}{n-1}$$

Where:

  y = individual WTP bid

  $\bar{y}$ = sample average WTP bid

  n = sample size

  s^2 = variance

The formula for the standard deviation is simply the square root of the variance.

$$(2.2) \quad s = \sqrt{\frac{(y-\bar{y})^2}{n-1}}$$

Using these formulas, the variance for the WTP estimate in the example is $47,784 while the standard deviation is $218.

While the standard deviation and variance are absolute measures of dispersion, a relative measure of dispersion can also be computed. This measure is called the coefficient of variation and is computed as:

$$(2.3) \quad V = s/\bar{y}$$

In the above example, $V = 218/241 = .90$. The relative variability of the sample amounts to 90 percent of the average WTP. The coefficient of variation can be useful in estimating sample size. This use of the measure will be presented later in this chapter.

These measures of dispersion of bids about the sample mean provide information about the distribution of individual WTP bids in the population. The variability of the individual WTP bids from the sample average can be used as a measure of the variability of individual WTP bids in the entire population. From this assumption a very important statistic, the standard error of the mean, can be computed. This statistic is the standard deviation of a distribution of means of repeated samples which theoretically could be taken. That is, the one sample which was taken is part of a distribution of samples which could be taken. It is impossible to know where in the distribution of

samples the particular sample lies (i.e. near the center of the distribution or near the tails of it). However, on the basis of the central limit theorem, it can be assumed that the distribution of samples which could be taken would approach a normal distribution in shape and characteristics. In a normal distribution, probability theory indicates that approximately 68 percent of the samples will fall within ± one standard deviation of the population mean, that 95 percent of all samples will fall within ± two standard deviations, and that virtually all (99.7 percent) will fall within ± three standard deviations.

However, we do not know what the true value of the population mean is, nor do we know what the true value of the population standard deviation of sample means is. To surmount these obstacles we substitute the best estimate of these values that we have. In the case of the population mean this is the mean from the one sample which was actually taken. In the case of the sampling distribution standard deviation it is the statistic called the standard error of the mean computed from the sample data. The formula for the standard error of the mean (assuming simple random sampling) is:

(2.4) $s(\bar{y}) = s\sqrt{n}$

As can be seen, the two components of the statistic are the measure of dispersion of the individual values about the sample mean, and the sample size. Larger sample sizes increase the denominator, thereby reducing the size of the standard error. Likewise, samples with tight distributions and hence small standard deviations reduce the size of the numerator and reduce the standard error.

For the example being considered, the standard error computation is as follows:

$$s(\bar{y}) = 218\sqrt{235}$$

$$= 14.2$$

This figure can be used to develop an estimate of the range within which the true population WTP is likely to fall:

(2.5) $y_{\text{lower bound}} = \bar{y} - t^*(s(\bar{y}))$

(2.6) $y_{\text{upper bound}} = \bar{y} + t^*(s(\bar{y}))$

The symbol t is the Student's t value. Common confidence probabilities and associated t values are shown below.

Confidence Probability(%)	50	80	90	95	99
T-value	0.67	1.28	1.64	1.96	2.58

For a 95 percent assurance that the sample result will not be further from the average WTP if all boaters had been interviewed, the figures would be:

$$y_1 = 241 - 1.96(14.2)$$
$$= 213$$

$$y_u = 241 + 1.96(14.2)$$
$$= 269$$

Thus there is a 95 percent probability that the true average WTP of the population, of boaters falls between $ 213 and $ 269.

Finite Population Correction

The above estimates are for a population of boaters which is infinite; however, in this example, the sample was drawn from a population of 1200 boaters. In those instances where the sampling fraction is larger than 5 percent of the population a finite population correction factor should be introduced. This correction controls for an overestimate of the size of the standard error given the assumption of an infinite population size.

The formula for the fpc is:

$$(2.7) \quad fpc(v) = \frac{N-n}{N-1} \qquad \text{for variance estimates}$$

and

$$(2.8) \quad fpc(s.e.) = \sqrt{\frac{N-n}{N-1}}$$

for standard error estimates

Since, in our example the sample is greater than five percent of the population the fpc should be employed. The standard error equation with the fpc correction is as follows:

$$(2.9) \quad s(\bar{y}) = \frac{s}{n-1} \sqrt{\frac{N-n}{N-1}}$$
$$= 12.74$$

The reduced value then is used to compute the confidence intervals and at the 95 percent level values of $ 215 and $ 266 are obtained for the lower and upper bounds respectively.

Thus, the sample approach has provided a point estimate of WTP for boaters. In addition, it has provided an interval estimate of WTP to which a probability of being correct can be attached. Having looked in general at how sample estimates are computed and used, the next section examines in greater detail the process of developing representative samples for use in CV studies.

Steps in Sample Selection

Several steps are involved in order to achieve the goal of selecting a representative sample. These steps can be grouped into the following headings:

(1) Identify the population to be sampled

(2) Determine the degree of precision required in the estimates to be obtained

(3) Determine sample design

(4) Determine sample size

(5) Select the sample

The paragraphs below discuss these steps.

(1) Identify the population to be sampled

The population of a survey must be described completely and specifically. For example, if the study were measuring WTP of boaters who could use a marina facility, in order to identify the population to be surveyed, it would be necessary to ask and answer questions such as the following: What is the market area of the marina - i.e. within what area do I want to consider boaters as being potential users of the marina? Do all boaters qualify as potential users - are there characteristics of the project, e.g. depth of basin, which might eliminate some types of boats? The population as defined and specified becomes the frame from which the sample is selected and to which the results of the survey will be generalized. It is therefore important that the population appropriate to the study's objectives be identified and used as the sampling frame.

It can sometimes occur that a survey will need to identify more than one population to obtain estimates about. In CV studies there are WTP estimates of use value, option value and existence value. It is possible that each of these WTP values would be drawn from separate populations. For example, in the marina study referred to above, it is likely that the specified set or sub-set of all boat owners within the defined market area would constitute the population for obtaining WTP from use value; however, it is clear that this population probably would underrepresent those who might have WTP because of option value or existence value. In this situation it might be necessary to identify another population composed of non-boat owners from which to obtain

estimates of option and existence values. In this case it becomes important to insure that a member of one population not be included in the other population; in this example, that means an individual could only belong to either the boater population or the non-boater population, but not both.

(2) Determine the degree of precision required

Precision refers to the closeness of fit between the estimates obtained from the sample and the true population value. The only way of being absolutely certain that the sample values are equal to the population values is to sample the entire population. Short of this operation, the issue then becomes one of determining how close the sample estimates need to be to population values in order to achieve the objectives of the survey. This assessment is likely to reflect on considerations such as the role the information will play in the decision-making process and what options would be opened or closed on the basis of the information obtained.

In the case of CV studies, the central objective of the survey is to develop WTP estimates for various amenities. In order to select an appropriate sample, how close do the estimates obtained from the sample need to be to the population WTP values? Would it be acceptable if the statement could be made that the sample estimates were within ± 5 percent of the true value? What about ± 10 percent? These questions need to be answered explicitly because they will have a considerable effect on the size of the sample to be chosen. As suggested above, the only way to insure complete precision is to survey the entire population; yet as desired level of precision increases so does sample size and therefore survey costs. In practice it is likely that a tentative

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answer to level of desired precision will be chosen and used to compute a needed sample size. Survey costs associated with this target sample size would then be estimated and compared with the funds available for the survey. Based on this comparison either the desired level of precision or the amount of funds available for the survey could be adjusted.

(3) Determine Sample Design

Sample design refers to the method by which individual elements in the population are identified and selected for inclusion in the sample. Designs should be chosen on the basis of considerations about the population - e.g. its degree of homogeneity, its geographical dispersion - coupled with any special considerations or constraints defined by the particular uses of the analyses to be performed.

Simple random sampling (SRS), discussed below is probably the most widely used sample design; however, special situations, considerations, or characteristics of the population may make this design less efficient and/or less accurate than other designs. Besides SRS, this section also describes two other sample designs - stratified random sampling and multistage cluster sampling - which have relevance for CV studies. In addition to describing procedures for developing samples using these methods, the computation of sampling errors for each design is illustrated.

Simple Random Sampling (SRS): This procedure is the most basic sample design. Each unit of the population is assigned an identification number. A desired sample size is computed, and a table of random numbers (or some other

randomizing procedure) is used to select the sample. For example, if there were 5000 boaters constituting the population, each boater would be assigned an identification number ranging from 1 to 5000. A sample size would be independently computed - say it was 350. A table of 4-digit random numbers would be consulted and the first non-duplicative 350 numbers between one and 5000 would constitute the sample.

A variation on this design is called systematic sampling. This procedure uses a randomly chosen starting point to select a sample. In the example above, with the needed sample size of 350, a systematic sample design would first compute the sampling fraction represented by this sample size - this fraction would be 5000/350 or 14.3 say 14. A starting point is then chosen by consulting a list of random numbers and selecting the first number between one and the sampling fraction (i.e. 14). If in the example the first number between one and 14 were 9, then the sample would be composed of the ninth boater on the list, the 23rd (i.e. 9 + 14), the 37th (23 + 14), and every 14th person thereafter. This procedure is easier to employ than simple random sampling, and unless there is a periodicity in the listing of the population it will yield results comparable to those obtained by simple random sampling. Periodicity in the population data occurs when there is some regularly occurring pattern in the data. In general such periodicity should be easy to detect by inspection of the population list and by asking about the way the list is structured.

The major advantages of SRS include its broad acceptance and familiarity. The method requires very little advance knowledge about the population such as would be necessary if stratification were being employed. The computation of

sampling error (illustrated in the example on page II-3) is straightforward and easily done. Disadvantages of the method include potential time and expense associated with developing a complete frame from which to draw a sample. For example, in a large city it might be prohibitively expensive or time consuming to compile a list of all households from which to draw a SRS. While it may be possible to find already available lists -- e.g. utility bill lists -- these types of lists should be carefully evaluated to determine if they are fully representative of the population of interest. For example, a utility bill listing may be biased toward property owners; renters whose utilities are paid by landlords would not be on the list. Where some information about the population is available, stratified designs can reduce the sampling error and yield more precise estimates of WTP than SRS would provide.

Stratified Random Sampling (STRS): In this procedure the population to be sampled is subdivided into a number of units or strata from which subsamples are drawn. This procedure is most advantageous when the population can be differentiated on the basis of some characteristic which may have importance to the study. For example, in measuring WTP for an amenity, a characteristic of the population which is likely to have some importance is income. If the population could be subdivided into a number of strata on the basis of income, a smaller sample could be taken than with a simple random sample to achieve the same level of precision. Or put another way, the same size sample using a stratified design would yield a more precise estimate of WTP than would the simple random sample design.

The reason for the gain in precision with stratified sampling is a function of the characteristic of the statistic for determining sampling error - the standard error. The standard error has two components - the variance and the sample size. The greater the homogeneity in a population the smaller the variance and the smaller the standard error. With stratified sampling the population is divided into relatively homogeneous subsets. These subsets or strata would have smaller standard deviations.

These smaller standard deviations of individual strata are weighted and pooled to arrive at a total estimate of error. There are two methods for weighting the standard deviations of individual strata. The first and most common is termed proportionate weighting. In this procedure the number of units in a particular stratum to be selected in a sample is proportionate to the number of units in the population which fall within this stratum. For example, if there were 150 persons in a particular income category in a population of 1200 then in a proportionate stratified random sample 150/1200 or 12.5 % of the sample to be drawn would be composed of individuals in this income category. Weights for pooling the standard deviations among strata then correspond to these proportions.

A second way of weighting the strata standard deviations is to select non-proportionate sample sizes in strata. This course of action might be advisable under certain circumstances, as, for example, if particular strata had too small a number of cases.

The procedure for selecting a proportionate stratified random sample is straightforward. First, the population is grouped into discrete strata on the basis of whatever stratification variables have been selected. Once again these stratification variables should have some conceptual relationship to the WTP variable of interest. The number of the population in a particular stratum is then divided by the total population to determine the proportion of the population in that stratum. This proportion is then multiplied by the desired sample size to obtain the required number from the stratum to be included in the sample. The actual sample for each stratum is then drawn using either simple random sampling or systematic sampling procedures.

For example, assume that data on length of boat owned by the population of 1200 boaters was available. The distribution of the population is as follows:

Boat Length	N	%
< 10'	128	10.6
10-15'	398	33.2
16-20'	408	34.0
21-26'	144	11.9
> 26'	122	10.2
	1200	100.0

Assume that a 20 percent (i.e. n = 240) sample is desired. To obtain a proportionate stratified random sample the desired sample size is multiplied by the proportion of the population in each stratum:

Boat Length	sampling fraction	*	desired sample	=	stratum n
< 10'	.106		240		25
10-15'	.332		240		80
16-20'	.340		240		82
21-26'	.119		240		29
> 26'	.102		240		24
					240

The actual sample within each stratum is then drawn using SRS or systematic sampling.

The second stratified random sample design is called disproportionate stratified sampling, and as the name implies, refers to situations where the sample strata are not proportionate to their number in the population. The rationale for a disproportionate design is the need to include a large enough number of cases in a particular strata for detailed subanalyses or to insure a more reliable estimate of dispersion around the stratum mean. In the example above, it can be seen that the proportion of the population in the lowest and highest strata are somewhat small. A disproportionate design could be employed whereby these strata could be increased in size while one or both of the middle strata could be decreased.

A major advantage of proportionate stratification designs is that they are self-weighting. That is, parameter estimates of population values can be obtained without adjustment. Disproportionate stratification, however, requires adjustment in the weight of strata before parameter estimates can be computed. For example, in the proportionate stratified example, the mean WTP is $241. Say, however, a disproportionate design was employed in which the strata were sampled with the sampling fractions shown in column 5 of Table II-2 instead of the proportionate sampling fraction (column 3). If this design were employed and no adjustments were performed, the overall mean WTP is computed as $231. This outcome occurred because of the overrepresentation of some type of cases in the sample and the underrepresentation of others relative to the proportion of such cases in the population. To compensate for the under or

overrepresentation of some strata, it is necessary to compute a weighted average for the overall WTP in which the weights are the actual proportions of the strata in the population. These weights correspond to the sampling fraction of a proportionate stratified sampling design and are shown in column 3 of Table II-1. This procedure compensates for the effect created by disproportionate weighting and produces the unbiased mean WTP.

Because of the added difficulty in computing parameter estimates introduced by disproportionate designs, it has been noted that in order to make a departure from the simplicity of proportionate stratified random sampling worth the added trouble, a sampling fraction would need to be increased by a factor of two (Moser, 1973: 94).

Table II-1. Comparison of Population WTP Estimates Produced by Proportionate and Unadjusted Disproportionate Designs

Length of Boat (1)	Stratum Mean (2)	Proport. Sampling Fraction (3)	Proport. Stratum Weight (4)	Disprop. Sampling Fraction (5)	Disprop. Stratum Weight (6)
< 10'	105.64	.106	11.24	.15	15.85
10-15'	241.88	.332	80.29	.25	60.47
16-20'	292.64	.340	99.62	.25	73.16
21-26'	332.36	.119	39.60	.20	66.47
> 26'	102.00	.102	10.42	.15	15.30
		1.00	241.17	1.00	231.25

Computation of Error Terms

The formula for deriving the standard error of the mean for stratified random sampling is:

$$(2.10) \quad s(\bar{y}) = \sqrt{\sum_{h=1}^{m} \frac{w_h^2 * s_h^2}{n_h}} \sqrt{\frac{N-n}{N-1}}$$

where:

m = number of strata,

h = stratum,

w = weight assigned to stratum (n_h/N),

s_h^2 = variance of the hth stratum,

n_h = sample size of the hth stratum, and

N = total population.

The second term on the right under the radical represents the fpc and can be ignored when the sampling fraction (n/N) is less than five percent.

To illustrate the computation of the standard error using this formula we will return to our original example considered in the case of simple random sampling. Recall that the mean WTP for launching was $241 with a standard deviation of $218 and a standard error of 12.74. Assume that a proportionate stratified random sample was selected using income as the stratification variable.

The following table presents the results obtained from the survey of WTP:

Boat Length	w_h	s_h^2	n_h	$w_h^2 s_h^2/n_h$
< 10'	0.106	40990.	25	18.10
10-15'	0.332	38449.	80	53.18
16-20'	0.340	40976.	82	58.05
21-26'	0.119	39007	29	10.08
> 26'	0.102	23721	24	10.08
			240	178.60

standard error = 178.6 1 - 240/1200

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This standard error can be used to develop confidence limits for the mean WTP in the same manner as for simple random samples. Given the standard error for stratified design the upper and lower confidence limits at the 95 percent level of confidence are $218 and $264 respectively.

It can be seen that the standard error term obtained through stratified random sampling is smaller than that obtained by simple random sampling (11.96 versus 12.74). This increase in precision was obtained because of a reduction in the variance achieved by creating more homogeneous WTP distributions through stratifying on length of boat. Actually, the increase in precision in this instance was not especially dramatic because boat length did not have a very strong relationship to WTP bids. The major disadvantage of stratification is the increase in time and effort to create the strata. Also, the computation of error terms is made somewhat more difficult.

Multistage Cluster Sample Designs: Multistage Cluster Sampling (MSCS) procedures are of primary value in sampling large and geographically dispersed populations. In CVM this situation is likely to be common, arising where a user or potential user group for an amenity comes from a market demand area encompassing several counties, a region, etc.. In this situation it likely would be time-consuming and expensive to compile the sampling frame for either a simple random sample or stratified random sample design. (In some cases, of course, suitable lists might already be available -- e.g. utility lists, bulk mail mailing lists, etc. — which could serve as the basis for a sampling frame.) In most situations where a ready-made sampling frame is not available,

the MSCS technique can be useful. The basic purpose of MSCS is to reduce the burden of enumeration of the population by aggregating the population into larger units, or clusters, and drawing a sample of these clusters. Enumeration of units in sampled clusters is then performed and a sample drawn from the enumeration. The process of listing and sampling can be performed as many times as is necessary in MSCS designs. However, each stage adds additional complexity to the design. Primary disadvantages of the method are the greater complexity in execution, in computation of sampling error, and the larger sampling error which is associated with the use of the method.

In a two-stage MSCS a list of primary sampling units (PSUs) is first compiled. PSUs in CV studies might be census tracts or blocks or perhaps sectors which have been overlaid on a map. These PSUs could then be stratified if appropriate, and a sample is taken. A listing of the units in each sampled PSU is then compiled and a sample from these secondary sample units (SSUs) is taken. In CV studies it is likely that individual households will form the SSUs, so a listing of all households would be compiled in each sampled PSU and a sample of these households actually taken. A simple random sample or a stratified sample could be taken of the SSUs. Once again, the chief benefit realized from this procedure is that it eliminates the need to completely enumerate all households - only those in sampled PSUs would need to be enumerated.

There are several design considerations in a MSCS. In general, it is preferable to have a larger number of PSUs and a smaller number of SSUs than vice versa. For example, assume a sample of 400 households was needed. At

one extreme the sample could be obtained by a complete enumeration of several blocks. Here the PSU = perhaps 4 or 5, and the SSU = 100 or so. At the other extreme the sample could be obtained by sampling one household from 400 blocks. Here PSU = 400 and SSU = 1. In both cases the required sample was obtained; however, intuitively, it can be seen that a sample design which spreads households over a broader geographic area in which greater diversity among households is likely to be encountered, is superior to a design which concentrates selection in a smaller area which is likely to be less representative of the entire population. Determining the mix between the number of PSUs and the selection rate for SSUs is essentially a matter of judgement conditioned by cost considerations.

A potential problem in the use of MSCS designs occurs when PSUs differ markedly in size from one another. When this situation occurs the actual units to be sampled can have different probabilities of being selected. Unless this effect is controlled for in some way, bias can be introduced into the sample selection process. The most common way of controlling for differences in size of PSUs is to employ a selection method called probability proportionate to size (PPS). In this method size differences in PSUs are explicitly factored into the sample selection process so that each unit in the population has an equal chance of being selected. This is accomplished by performing several operations, as illustrated in the following example.

Example:

Estimates of WTP for use, option and existence values for proposed enhancement of a beach near a medium-sized city of 50,000 households are sought. The

market demand area for the beach essentially consists of the city. Direct users of the current beach would be surveyed to provide an estimate of use value for the enhanced beach; however, a general population survey is also needed to estimate potential use and existence value of those not using the beach.

It has been decided that:

1. A target sample size of 400 households is sought. A sample of 490 will be drawn given assumptions about response rates and occupancy rates (described below).

2. The sample will be selected in about 120 blocks.

3. Blocks will be selected with PPS. A listing of the housing units in selected blocks will be performed and a subsample of about 4 housing units will be taken for each selected block.

The following steps must be performed to obtain this sample:

1. Generate a listing of blocks. Census block statistic reports and maps can be employed to obtain a listing of blocks in metropolitan areas. These blocks average a population of about 90 persons. In areas where block statistics and maps are not available it may be necessary to move up to the next lowest unit of enumeration for which population data are available (i.e. census tract) for enumeration of the following information:

* Block identification number - used to keep track of the block

* Measure of size - approximate population or households in the block. Once again, this information should be obtained from the latest census; however, where this information is unavailable, reasonable approximations can sometimes be made by using maps which provide counts of dwellings (e.g. county "blue-line" road maps, etc.).

2. Identify areas of new construction completed since the last census. Areas of new construction and large increases in population should be identified and used to update block population estimates. In general, a rough estimate of within ± 20 percent of the actual number of housing units is sufficient (Gurney, 1972).

3. Update list of blocks and make adjustments. The listing of blocks made in step 1 is updated based on identification of new construction and development. Blocks with very small populations can be combined with other blocks. Similarly, blocks with very large populations can be split. Such adjustments should be recorded and reflected in subsequent procedures.

4. Select the sample of blocks. The selection process requires several steps:

   a. Develop sampling fraction. The sampling fraction is defined by the formula:

(2.11) $f = \frac{n}{N}$

where

    N = the total number of households in the population,

    n = the number of households to be selected, and is defined as:

(2.12) $n = \frac{n'}{r} * 0$

where:

    n' = desired number of completed interviews

    r = estimated response rate

    0 = occupancy rate

For example, assume the desired number of completed interviews is 400, the estimated response rate is 85 percent and the occupancy rate is 96 percent.

    n = 400/.85 * .96

      = 490

The overall sampling fraction (f) which will produce the number of 490 households is:

    f = 490/50000

      = 1/102

That is, one of every 102 housing units will be sampled.

b. Determine the PPS estimator. This estimator is provided by the formula:

(2.13) $E = \dfrac{N}{B}$

where:

E = PPS Estimator,

N = the total number of households in population interest, and

B = the total number of blocks in the sample.

For example, the estimator in the example is:

E = 50000/120

= 417

This estimator is used to determine the probabilities of selecting particular blocks for the sample:

(2.14) $P_i = \dfrac{N_i}{E}$

where:

P_i = probability of selecting the ith block, and

N_i = number of households in the ith block.

For example, if a block had 55 households the probability of being selected for the sample would be 55/417 or .132 or 1/7.6.

Since blocks of varying size would have different probabilities of selection, the individual households in the blocks would have different probabilities of selection. This outcome would introduce bias into the sample selection process and needs to be controlled. PPS sampling accomplishes this control by equalizing the probability of selection for the individual through introducing another selection probability for selecting individual households on those blocks which have been chosen for inclusion into the sample, and setting the joint probability for the selection of the block and the individual households equal to the overall sampling fraction.

Symbolically the above is expressed as:

(2.15) $P_{ij} = f = P_i * P_j$

where:

P_{ij} = the probability of selecting the jth household in the ith block,

P_j = the probability of selecting the jth household; this probability is expressed by $P_j = n_i/N_i$, and

n_i = sample size in ith block.

To illustrate, assume that a block had 55 households. The formula would work out as follows:

$$P_{ij} = f = N_i/E \ast n_i/N_i$$

$$1/102 = 55/417 \ast n_i/55$$

$$1/102 = n_i/417$$

$$n_i = 4.08$$

That is, $p_j = 4.08/55$ or $1/13.5$

The joint probability of selecting an individual household on the block is therefore $55/417 \ast 4.08/55$ or $.132 \ast .074$, which equals the sampling fraction probability of .0097.

c. Select sample blocks. The selection of sample blocks first requires the identification of any blocks which have a greater number of households than the PPS estimator E. These blocks are called certainty blocks, meaning they have a certainty of being included in the sample. Any certainty blocks should be identified and set aside. For all non-certainty blocks the following procedures should be employed:

(1) Create a table listing all blocks, showing block identification number, identification information (see steps 1 and 2), the number of households on the block, and the cumulative number of households. Table II-2 illustrates how such a table would look.

(2) Employ a systematic sampling procedure (see description in section on simple random sampling) using the interval obtained by the PPS estimator E.

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Table II-2. Sample Block Listing Table

Block ID Number	Identification Information *	Households	Cumulative Number of Households	Selection Range
1	Zone 1, Block 5	55	55	00001-00055
2	Zone 1, Block 6	32	87	00056-00087
3	Zone 1, Block 4 and Block 3	75	162	00088-00162
4	Zone 1, Block 2	60	222	00163-00222
5	Zone 2, Block 1	32	254	00223-00254
6	Zone 2, Block 2	75	329	00255-00329
7	Zone 2, Block 3	100	429	00330-00429
8	Zone 2, Block 4	60	489	00430-00489

*Information should enable specific blocks to be identified - generally identification is keyed to a map.

In the example, $E = 417$, assume that the random number between 1 and 417 selected was 047. The first block selected would be number 1 containing the cumulative total of 047, the next block selected would be number 8 containing the sum of $047 + 417$. The selection process would continue until the total sample of blocks has been selected.

5. List the households in the sample blocks

After the sample of blocks has been obtained, all households in each block must be enumerated. The listing should include the address of each household and any pertinent information which could enable interviewers to identify the unit if it is selected. In addition, a cumulative total of households should be compiled for each block.

6. Select the households to be interviewed in the sample blocks

This operation essentially mirrors the procedures employed in steps 4b and 4c. The sampling interval to be used to select the households is that obtained in equation 15.

In the example, the sampling interval was $4.08/N_i$. If a particular sampled block had 32 households, the interval would be $4.08/32$ or $1/7.8$. That is, every 7.8, say 8, households would be selected in the block. The standard systematic sampling procedure is employed, whereby a random number between 1 and the sampling interval for the block (i.e. 8) is chosen, and the first household is selected. Successive households are selected on the basis of the initial number selected plus the sampling interval. Thus, if the random number chosen was 2, the second household on the list would be selected, the next household selected would be the 10th ($2 + 8$), the next the 18th, and the final household for the block the 26th.

Employing this procedure ensures that all households have the same selection probability. This can be seen by inspecting the selection probabilities for two blocks of different sizes:

Block	N_i	P_i	P_j	$P_i * P_j$
1	32	.076	.1275	.0097
2	64	.153	.0637	.0097

For certainty blocks (those blocks with a probability of 1 of being selected) the overall sampling fraction becomes the sampling interval for the blocks.

Thus, in the example, if a block had 420 households, the sampling interval for the block would be the overall sampling fraction of 1/102.

Measures of Error

One of the most common mistakes made in MSCS designs is using measures of error computed as if the design were a simple random sample. Computing sampling error in this fashion underestimates the amount of error in estimates obtained. Simple random sampling has only one component of variance -- the distribution of scores around the mean. MCSC designs, however, have variation composed of the distribution of scores around their cluster means, as well as variation of cluster means from the overall mean. In the two-stage design used in the example, there is variation of individual WTP bids of households around the mean WTP bid for each block. In addition, there is variation of the mean WTP bid for each block around the overall mean WTP bid.

For a two stage design, the formula for the variance of a sample mean (Kish, 1965: 167) is:

$$(2.16) \quad var(\bar{y}) = \left[(1-a/A) * s_a^2/a \right] + \left[(1-b/B) * s_b^2/ab \right]$$

where

    a = number of PSUs selected,

    A = Total number of PSUs,

    b = number of SSUs per cluster, and

    B = Total elements in cluster,

and,

    s_a^2 = between-clusters variance, which is provided by the formula:

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$$(2.17) \quad s_a^2 = 1/(a-1) \ast \sum_{i=1}^{a} (\bar{y}_i - \bar{y})2$$

where

$\quad \bar{y}_i$ = mean of individual cluster,

$\quad \bar{y}$ = grand mean,

and,

$\quad s_b^2$ = within-clusters variance, which is provided by the formula:

$$(2.18) \quad s_b^2 = 1/(a(b-1)) \sum_{i=1}^{a} \sum_{j=1}^{b} (y_{ij} - \bar{y}_i)^2$$

In the formula above, the double summation indicates that the quantity is the sum of the individual variances of SSUs for each PSU mean. The standard error of the mean is the square root of the variance. To illustrate the computation of sampling error, assume that a PPS two stage sample is taken in which seven blocks out of 50 are selected (a=7, A=50). Each block has approximately 28 households, and four interviews per block are performed (b=4, B=28).

The data for WTP is summarized below in Table II-3.

Estimation of Sample Size

A critical decision to be made in survey work is the size of the sample. Too large a sample wastes resources, while too small a sample limits the precision

Table II-3
Computation of Sampling Error for Multi-Stage Cluster Sample

Block b=1-4 WTP bid

a	$y_{a,1}$	$y_{a,2}$	$y_{a,3}$	$y_{a,4}$	$y_{a,b}$	$\bar{y}^2_{a,b}$	$\Sigma y_{a,b}$	$\Sigma(y^2_{a,b})$	$\Sigma y^2_{a,b} - \dfrac{(\Sigma y_{a,b})^2}{b}$
1	0	10	5	0	3.75	14.0625	15	125	68.75
2	0	5	7	2	3.5	12.25	14	78	29
3	0	5	15	10	7.5	56.25	30	350	125
4	7	5	4	10	6.75	45.5625	27	201	18.75
5	0	0	0	0	0	0	0	0	0
6	12	5	9	0	6.5	42.25	26	250	81
7	5	5	10	25	11.25	126.5625	45	775	268.75
					39.25	296.9375	157		591.25

$y = 5.6$

$$s_a^2 = \frac{1}{(a-1)} \left[\Sigma \bar{y}^2_{a,b} - \frac{\Sigma (y_{a,b})^2}{a} \right] \qquad \text{between-clusters variance}$$

$$= \frac{1}{7-1} * 296.9 - \frac{(39.25)^2}{7}$$

$$= \frac{1}{6} * (296.9 - 220)$$

$$= 12.8$$

$$S_b^2 = \frac{1}{a(b-1)} \; \overset{a}{\Sigma}\overset{b}{\Sigma} \left(y^2_{a,b} - \bar{y}^2 \right) \qquad \text{within-clusters variance}$$

$$= \frac{1}{7(4-1)} * (591.25)$$

$$= 28.15$$

$$var(\bar{y}) = \left(1-\frac{a}{A}\right)\frac{s_a^2}{a} + \frac{(1-b)}{B} \frac{s_b^2}{ab} \qquad \text{total variance}$$

$$= \frac{(1-7)}{50} * \frac{12.8}{7} + \frac{(1-4)}{28} * \frac{28.15}{7*4}$$

$$= 1.57 + .86$$

$$= 2.43$$

$$s.(\bar{y}) = \sqrt{2.43} \qquad \text{standard error}$$

$$= 1.56$$

of inferences about the population of interest which can be drawn from the sample.

In general, the larger the sample the less sampling error associated with the estimates obtained. The formula presented below can help in making an initial determination of sample size. However, use of the formula requires making some assumptions which may not be borne out. In addition, in the final analysis the extent of resources available to do the survey will probably be the most significant determinant of the sample size.

An estimate of sample size for simple random samples is provided by the formula:

(2. 19) $n_o = t^2 * \dfrac{v^2}{r^2}$

Where:

n_o = minimum required sample size,

r = target tolerated limits of error between sampled average WTP and actual average WTP of the population. A determination of the amount of tolerated error associated with the estimated WTP must be made. Is WTP $\pm$ 5 percent necessary? Would WTP $\pm$ 10 percent be sufficient for the study needs?

t = tolerated risk of estimate. While confidence limits can be computed for WTP estimates, there cannot be complete assurance that the accuracy shown in the estimated confidence level has been obtained. Instead, a probability of having achieved the sampling error which has been computed must be specified. Generally, this tolerated risk of accepting an estimate which is in error by more than the computed sample error is very low - usually a one in 20 (95 percent assurance) or a one in 100 (99 percent assurance) chance.

V = coefficient of variation of WTP estimates. Estimation of sample size depends on some advance estimate of the distribution of the WTP bids. The coefficient of variation is specified as the ratio of the standard deviation to the mean of a distribution. For most CV studies done thus far, the V has averaged around unity. This value appears to be a good first approximation for estimating sample size unless more specific data are available.

The formula has been used to create Table II-4 below. These tables show the minimum sample size required to meet the assumptions employed in the borders of the tables.

Table II-4
Minimum Required Sample Size

For t = 1.96 (tolerated risk = .05)

		0.5	$\frac{V}{1}$	1.5	2
	.01	9604	38416	86,436	153664
limits of	.05	384	1537	3457	6147
error (r)	.10	96	384	864	1537
	.15	43	171	384	683

For t = 2.58 (tolerated risk = .01)

		0.5	$\frac{V}{1}$	1.5	2
	.01	16641	66564	149769	266256
limits of	.05	666	2663	5991	10650
error (r)	.10	166	666	1498	2663
	.15	74	296	666	1183

To illustrate the use of the tables, assume that an estimate of sample size for the population of 1200 boaters described earlier is needed.

   a. *Assume that we are willing to accept an error in the sample mean of* $\pm$ 10 *percent of the true population mean WTP, i.e.* $r = .10$.

   b. Assume that we are willing to accept a 1 in 20 chance that the assumption in (a) is wrong, i.e. $t = 1.96$.

   c. Assume that the $V = 1$.

   d. Then,

$$n_o = 1.96^2 * (1)^2 / (.10)^2$$

$$= 384$$

As can be seen this figure corresponds to the entry in column 2, row 3 of the upper portion of Table II-4.

For samples which are greater than five percent of the population a finite population correction (fpc) for sample size is employed:

$$fpc = N/(N + n_o - 1)$$

In the above example, since 384 is a significant fraction of the population of households with boats, by employing the fpc, the minimum required sample size becomes:

$$n = 384 * [1200/(1200 + 384 - 1)]$$
$$= 291$$

Finally, some assessment of probable response rates should be made and adjustments made to compensate for non-response. If, for example, an 85 percent response rate were assumed, it would be necessary to increase the sample size in the above example to 291/.85 or 342.

The above sample size estimate presumes a simple random sampling strategy. More complex designs will influence sample size estimates. In general, stratified designs will reduce the amount of variation in the sample and lower the coefficient of variation. Stratified designs are thus said to have an improved design effect or "deff". It is difficult, however, to provide advance estimates of the deff, therefore, the SRS estimate should probably be used.

In contrast to stratified sample designs, MSCS designs generally increase sample variance. In these cases the estimates of sample size will probably provide lower levels of precision than anticipated. For cluster designs it is

prudent to estimate a deff of 1.5 and thus multiply the desired sample size obtained through use of the tables by a factor of 1.5.

It should be noted that the sample size provides the estimates of WTP within the assured levels of precision and assurance for the entire sample only. Analysts might also wish to compute WTP estimates for sub-groups within the population. When this operation is performed, the level of precision obtained will be directly influenced by the number of cases being worked with. If it is important that WTP estimates for particular sub-groups be obtained within defined limits of precision, then this need should be factored into the computation of sample size.

Conclusion

Sampling is an important part of a CV study. This chapter has presented issues which should be addressed in designing sampling strategies for obtaining WTP estimates and has described the procedures for using three sample designs likely to have application in CV studies. Sampling is a complex topic in its own right. The sources referenced in this chapter can provide further information about the design and implementation of sampling strategies.

Chapter III

DESIGN OF THE SURVEY INSTRUMENT

Introduction

Appendix A to this manual contains the master list of OMB-approved contingent
value questionnaires. Because each CV study is likely to have some unique
characteristics, it is impossible to provide a specific questionnaire for
every application. Therefore, the analyst must design his own questionnaire
by choosing from the master list those questions most relevant to his problem.
The master list provides only "generic" wording of question alternatives, so
that the analyst must tailor the question to the project or projects being
analyzed. This chapter provides guidance on designing the CV questionnaire.

Overview of Questionnaire Design

The questionnaire used in any CV experiment should be designed to minimize, to
the extent possible, the potential for the biases noted in Chapter I. The
introduction to the questionnaire used in any Federally sponsored survey must
indicate who is conducting the survey and also must inform the potential
respondents that they may refuse to answer any question and that their answers
will be kept confidential. The survey can take place through personal

interviews, by mail, or over the telephone. The body of the CV questionnaire is typically composed of three basic question sets. The questions in these three sections must be designed to provide all the individual information necessary to determine willingness to pay and NED benefits.

Prior to the application of the CV method, the analyst must have some fairly detailed information about the problem that the proposed project is designed to relieve and the outputs of the project. The population of interest must be identified and enumerated to the extent possible. Therefore, the analyst should not rely on the CV questionnaire to provide this information. A basic design consideration is to keep the questionnaire brief. Preferably, it should be capable of being completed in 15 minutes or less. Therefore, care must be also taken to avoid questions that provide information that is "nice to know" but that are not particularly important to the contingent value study. In addition, the analyst should not rely too heavily on the questionnaire as a project formulation tool. The project must be described in sufficient detail to provide information to the respondents to answer the WTP questions. Although variations of some of the project attributes across respondents may be useful in "scaling" a project, too many variations reduce the validity of the sample results or require a significant expansion in the sample size.

Pretesting

All CV questionnaires must be pretested. The purpose of the pretest is to examine the effectiveness and potential for protest responses of alternative

payment vehicles and questionnaire formats. Principles and Guidelines (P&G) recommends pretesting at least two alternative payment vehicles and WTP question formats. In addition, P&G recommends a pretest sample size of at least 30 respondents. Thus, the pretest results can be used to evaluate the effectiveness and sources of potential bias in alternative questions. The final questionnaire used in the CV survey must incorporate information gained from the pretest. Thus, the revised questionnaire should result in improved understanding of the questions by the respondents, increased effectiveness of visual aids, and greater willingness to participate in the CV survey. If possible, the pretest should not use the target population of the survey, but, instead, should use a population demographically and economically similar. This is particularly important where the target population is small. In addition, using the target population for the pretest could bias the survey responses due to advanced publicity about the purposes of the study.

Recreation Profile Section

The first section of the CV questionnaire is primarily designed to "set the scene" for the respondent and to establish credibility for the survey objectives. For recreation surveys, this can be accomplished by developing a recreational profile for each respondent through questions on the types and locations of individual or family outdoor recreational activities. For projects related to boating, the questions in this section may ask about boat ownership, the size of the boat owned, the frequency of use, and current

payments for launching and/or storing the boat. Again, the analyst must determine the information that is truly required and avoid redundant questions. Branch points are useful to direct respondents to skip questions that are not relevant to them.

The Willingness to Pay Section--Use and Option/Existence Values

The second part of the questionnaire is the heart of the CV approach and is used to determine the willingness-to-pay for the described recreational good. This section establishes the hypothetical market and describes the rules of the market. Institutional rules and concepts include: (1) who owns the recreational good; (2) that the provision of the good is costly; (3) how the good will be purchased if it is provided, i.e., the payment vehicle; (4) the property rights gained if the respondent chooses to purchase the good; (5) the effect of nonpayment of the "price" on the availability of the good; and (6) the use of the revenue generated from the sale of the good. These rules should reinforce the belief that the hypothetical market is real. In addition, the market rules should encourage familiar market behavior but should not be ethically offensive or threatening. For instance, respondents may find rules that require them to pay for recreational goods that are currently "unpriced" as threatening. Alternatively, rules that require payment for goods that respondents believe everyone should be able to enjoy free of charge may be regarded as ethically offensive. Respondents who take offense to the hypothetical market are unlikely to give accurate values to the WTP questions. Although this reaction and the resulting protests probably

cannot be completely avoided, the market rules should be established to minimize hostile reactions to the questionnaire. The respondent should be reassured that the existing recreational opportunities will continue to be available.

Payment Vehicle

In many situations, the choice of the payment vehicle is relatively simple. Typically, it is a per use, per day, per season, or per year charge. For a launch ramp, the payment vehicle could be a fee per launch or a fee for a yearly launch pass with an unlimited number of launches per year. For a new marina, it may be a yearly or monthly boat storage fee. Where the proposed project is an improvement to an existing recreational site, the payment vehicle could be an addition to the current use charge. It is extremely important that the payment vehicle chosen is familiar to the respondent. He is more likely to provide accurate valuation responses to the hypothetical situation if the payment vehicle is the same as his current method, or if he is aware of recreational sites where the method of payment chosen is currently used. Payment vehicles that are not prices for the direct use of the recreational site -- such as taxes -- should be avoided. As noted above, the description of the hypothetical market requires describing what is purchased by the payment. Thus, the units of measurement of the payment vehicle must be specific. These may be in dollars per permit per year or dollars per family admission pass per day.

In establishing the hypothetical market, visual aids such as photographs or artist's conceptions of the proposed recreational improvement should be used.

These prompts aid the respondents in determining the value of the recreational opportunity to them. In addition, the value statement describing three potential sources of value to the respondent for the recreational opportunity may be used. Case study experience, however, indicates that the value statement may needlessly lengthen the questionnaire. Therefore, it should be considered optional.

Following the description of the market, the actual WTP questions are asked. The basic form of these questions is "how much would you pay" or "would you buy if the price were X dollars." An alternative form is to: first, ask the respondent how much he currently spends on the types of recreational activities offered by the proposed site; then, ask if he is willing to pay X percent more for the right to use the proposed site. The format in which these questions are asked can be by iterative bidding, open-ended direct question, or close-ended direct question.

Iterative Bidding

Iterative bidding takes the form of a series of close-ended questions where the individual is asked if he is willing to buy the described quantity at some initial price. If a "YES" answer is given, the interviewer reiterates the question, but with some predetermined increment in the bid. Conversely, a "NO" bid requires the interviewer to reiterate the question but with some predetermined decrease in the bid. The bidding process for increments in the bid ceases when the respondent answers "NO" to the price with the latest

increment. The maximum WTP is recorded as the last amount to which the respondent answers "YES." For decreases in bids, the process ceases when the respondent answers "YES" to the last value. This represents the respondent's maximum WTP for the described good.

The choice of the starting point in the bidding process depends on the nature of the recreational opportunity and what the respondent is "buying" with the CV payment. In the case of a launch ramp, the starting point should be chosen based on launch fees, if any, at existing sites in the study area. For beach improvements, the starting point could also reflect the existing admission charges. The sample mean of the final bids determined in the pretest can also be used as one starting point. Additional points can then be the sample mean plus and minus 50% and 75%. In general, informed judgement is required to establish the starting point. Previous CV experiments have shown that the starting point is a potential source of bias; therefore, several starting points must be used. The chosen starting points must be varied randomly across the interviews so that each is used approximately the same number of times.

Open-ended

Using open-ended, direct questions, the respondent is asked to state the maximum amount he would pay for the described good. These types of questions have a significant advantage over iterative bidding formats because they can be easily adapted for use in mail and telephone surveys. In addition, some analysts argue that the open-ended, mail survey format provides more accurate

statements of the true valuation. These avoid the problem of interviewer bias and allow the respondents time for reflection about their true valuation of a nonmarketed good.

One of the potential problems of open-ended questions is that the individuals may be unsure of the maximum amount they are willing to pay. A payment card offering alternative amounts can be used to prompt the respondent. Example III-1 shows a typical payment card for use in an open-ended question.

Example III-1

Example Payment Card Prompt

0	100	200	300	400	500	600	700
25	125	225	325	425	525	625	725
50	150	250	350	450	550	650	750
75	175	275	375	475	575	675	775

Source: Desvousges, Smith, and McGivney, 1983, p. 4-17.

The amounts shown on the payment card prompt should include amounts from zero to the reasonable maximum amount that a respondent is likely to state. It is important, however, to assure the respondent that he is not restricted to the amounts shown on the payment card. There should not be too many payment amount alternatives, but there should be enough to avoid excessive gaps between alternatives. In general, the alternative payment card amount should increase in a fixed increment. The amounts should be arranged in a square or rectangular matrix form to minimize the potential for bias. The pretest should provide information on the appropriate amounts on payment card prompt.

Close-ended

Close-ended, direct questions require the respondent to answer a single WTP question with a "YES" or "NO" response. A significant advantage of close-ended questions over other types is that they are probably the easiest for respondents to answer. The offer bid must be varied randomly across respondents with at least 5-10 alternatives. The number of alternatives chosen, however, should be sufficiently small so that at least 30 respondents are asked each offer bid. A significant disadvantage of close-ended questions is that the data are more difficult to analyze. A "YES" answer does not imply that the maximum WTP is the offer bid nor does a "NO" answer imply that WTP is zero. The analysis of these types of responses requires the use of Probit or Logit analysis which is discussed in Chapter V.

If the payment vehicle chosen is on a per use basis, the respondent must be asked how often he would visit the site at his stated per use value. Care must be taken to determine how many other individuals are likely to accompany the respondent on each visit if a daily, per person user fee is charged.

Option/Existence Value

The second section of the CV questionnaire should also contain questions designed to determine the option and existence values for the recreational opportunity. The basic form of the question is to ask how much the respondent is willing to pay to have the recreational opportunity provided so it will be

available for his use and the use of others in the future, even if he doesn't plan to use it now. These questions can be iterative bidding or direct questions. Alternatively, the option and existence values can be related to the previously elicited user value by asking if the respondent is willing to pay X percent more, in addition to the use charge, to ensure that the recreational site is available in the future. The respondent must be cautioned that the option/existence value represents an addition to the amount he would pay for the use of the recreation site. In addition, care must be taken to ensure that the respondent understands that the option/existence payment is for the specific site and not for all sites that offer the type of recreational experience being offered.

The option/existence value question requires a different payment vehicle than in the direct use question. Because the respondent is not paying for something for his current, direct consumption, the payment vehicle will always have some voluntary connotations: this cannot be avoided. A payment vehicle that has been successful is a one-time payment to a non-profit foundation established to construct and maintain the recreational opportunity. The respondent must be made aware that the payment of the option/existence value will not entitle him to use the recreational site without the payment of an additional use charge. If annual payments are used, the respondent must be made aware that he would be expected to contribute the stated amount each year. A third alternative is to ask the respondent to pledge to pay an amount over a specified time period, say three years.

In some situations, the population of interest may be stratified into current

boat owners and the remainder of the population. Non-boat owners are not

likely to be paying the use fee even if they participate in boating.

Therefore, typically, only the option/existence value question is asked of

non-boat owners.

In general, there are a variety of ways of asking the WTP questions. The

actual wording chosen depends on the preferences of the analyst and on the

type of good or service being analyzed.

Protest Questions

The conclusion of the WTP section must include questions designed to

distinguish valid zero bids from zero bids that are protests to some part of

the CV questions, such as the payment vehicle. If both use and

option/existence value questions are used, a protest question should be used

after each. Valid zero bids are included in the evaluation of the WTP for the

proposed recreational opportunity; the responses of protest bidders are

omitted. Excessive numbers of protest bidders indicates that the offensive or

misunderstood questions should be rewritten. This is one role of the pretest

which must be carried out before the general survey of the population of

interest.

Example III-2 shows typical alternative reasons to be included as part of a

protest question.

Example III-2

Alternative Reasons for Protest Bid

NOT ENOUGH INFORMATION.....................................01

DID NOT WANT TO PLACE DOLLAR VALUE........................02

OBJECTED TO WAY QUESTION WAS PRESENTED...................03

COST GIVEN IS GREATER THAN THE FACILITY IS WORTH TO ME..04

OTHER (SPECIFY)...05

Socio-economic Profile Section

The final section of the CV questionnaire gathers information on the

socio-economic characteristics of the respondents. This information completes

the profile of the potential users and others who may value the proposed

recreational opportunity. Data on income, age, sex, etc. of the respondents

are used to estimate a WTP function, as described in Chapter V. This

information is also used as a check to determine whether the sample

characteristics match independently gathered information, such as census data,

on the characteristics of the market area population. If census data are

available, the analyst can infer WTP estimates for the market population based

on the estimated bid function.

Some respondents are likely to object to some of the background questions,
particularly income. A way of reducing non-response in personal interviews is
to provide a card with numbered income categories. The respondent can be
asked to call-off or point to the number of the category containing his
income. In many situations in the evaluation of Corps' projects, some of the
socio-economic profile questions can be omitted to reduce the length of time
required to complete the questionnaire and to improve the response rate. The
questions on education level and race can usually be omitted without creating
analysis problems.

Chapter IV

SURVEY ADMINISTRATION

Introduction

Survey administration refers to the means by which questionnaires are submitted
to respondents. There are two basic ways to administer questionnaires:
self-administered approaches and personal interviews. In self-administered
approaches respondents fill out the questionnaire themselves, while in personal
interviews respondents are asked questions by a staff interviewer. Personal
interviews can be performed in a face-to-face situation or over the telephone.
Each survey administration approach has its own strengths and weaknesses. This
chapter identifies these and discusses how each approach can be used with CV
questionnaires.

Self-Administered Surveys

The most common form of self-administered questionnaire approach is the mail
survey. Here the questionnaire, accompanied by a cover letter and a return
mailer, is sent to respondents. The questionnaire can be completed privately
and returned with the self-addressed, stamped mailer. In some cases
self-administered questionnaires can be handed out to respondents.

An important component of the self-administered survey is the cover letter.
The primary purpose of the cover letter is to interest the respondent in the
questionnaire enough that he will want to complete it. The letter should

quickly explain the purpose of the quetionnaire, why or how the respondent was chosen to participate in the survey, the length of time required to complete the form and the importance of the respondent's participation in the study. In addition, to comply with OMB requirements, the voluntary nature of the respondent's participation should be noted. Figure IV-1 shows a cover letter used in a CV case study.

Experience in testing the CV questionnaire suggests that it is well suited for self-administered surveys. All questions are "close-ended" multiple choice responses. In addition, the concept of WTP is something that most persons appear to be familiar with from daily experience in purchasing goods and services.

Figure IV-1. Sample Cover Letter for
Self-Administered Contingent Value Survey

Dear Boater:

You have been randomly selected to participate in a study by the U.S. Army Corps of Engineers. The purpose of this study is to determine the need for [nature of planned improvement].

Your participation in this study is entirely voluntary and you may refuse to answer any question. Because only a small number of people are being selected for the study, the participation of each person selected is extremely important. Most of the questions have to do with your attitudes and opinions and there are no right or wrong answers. The information you will provide will be kept strictly confidential.

The questionnaire should only take about 15 minutes to complete.

After completing, please return the questionnaire using the self-addressed, stamped envelope provided.

Thank you for your help.

Generally, the biggest challenge in using mailed questionnaires is trying to ensure that it will be answered and returned by the sample. Response rates of 10 - 15 percent are common with mailed questionnaires. Consequently, a good deal of effort has been made in trying to develop ways of improving response rates for mailed questionnaires. Some of these methods are summarized in Table IV-1. Additional in-depth discussions of various methods for increasing response rates can be found in Dillman (1978).

Probably the most widely applied method for improving response to mailed questionnaires is the use of follow-up mailings. In this procedure questionnaires are mailed out, then after a period of one to three weeks a follow-up letter is sent to those respondents who have not replied. The follow-up letter stresses the importance of the study and the respondent's participation and urges the respondent to complete and return the questionnaire without delay. In most cases another questionnaire is included with the follow-up letter in case the respondent has misplaced or thrown away the first questionnaire. Follow-up mailings are generally conducted only once or twice. If after two follow-up letters a respondent still has not mailed back a questionnaire it is likely he never will.

A problem can arise with follow-ups where respondents are promised anonymity. In these cases it is not possible to identify who has or has not returned questionnaires. Several approaches are available to deal with this problem. The first is simply to send a follow-up to all respondents thanking those who have responded and encouraging those who have not done so to respond. Another

approach is to assign each respondent an identification number and include this number on the address label. The identification number can be logged in when questionnaires are returned and then separated from the questionnaire. A third method which promises respondents greater certainty of anonymity is to include a post card with the questionnaire, cover letter and return mailer. The post card has an identification number or the respondent's name on it and is addressed to the Corps office. In the cover letter respondents are advised of the anonymous nature of the study, and are asked to return the post card at the same time they mail back their questionnaire. In this way respondents who have returned their questionnaires can be identified without identifying which questionnaire belongs to a particular respondent.

Another problem which users of mail questionnaires must frequently confront is that of using results when only a low percentage of questionnaires were completed. Sampling theory rests on the assumption of a representative sample having been drawn and having responded. When only 10-15 percent of a sample respond to a questionnaire, it is quite possible that respondents possessing certain characteristics will be over-represented, while respondents possessing other characteristics will be under-represented in the sample. In cases where a low response rate (i.e. under 50 percent) has been obtained, some assessment of the degree of representation of the obtained sample to the overall population should be made on characteristics for which information is available. Thus, comparisons could be made on imcome distribution, age distribution or other variables to ascertain whether, and to what extent, the obtained sample over-represents or under-represents particular segments of the population.

Examinations should then be made using cross tabular analysis or correlation analysis to determine if the variables on which the sample and population differ are associated with WTP. If an association is present, it is likely that average WTP estimates obtained are biased.

For example, assume that a mailed questionnaire achieves a 10% response rate. Sixty percent of those responding are high income; however, such individuals only make up 20 percent of the population of interest. Correlation analysis indicates that income is highly associated with WTP bids provided. The relevant data are shown below:

Income Class	Average WTP Bid	Sample N	Percent of Population
< 10,000	5	10	30
10,000-40,000	20	30	50
> 40,000	40	60	20
		100	100

Given this situation, it would be inappropriate to apply the WTP distribution to the general population without some adjustment. Such adjustments can be performed in a number of ways. The first method groups the population into strata based on the variable(s) showing statistically significant association, and applies the distribution obtained from the particular segment of the sample to the corresponding stratum in the population. Thus, using the data above, a cumulative distribution for the sample segment earning less than $10,000 could be created and applied to the stratum of the population earning less than $10,000, etc.

Table IV-1. TECHNIQUES FOR INCREASING RETURN OF MAILED QUESTIONNAIRES

Method	Possible increase of total % of returns	Remarks
Inducements	33%	Questionnaires containing a 25-cent coin produced better results than ones without. However, the population and the type of questionnaire could make such inducements unnecessary. Consider promise of report to respondent.
Method of return	Not known	A regular stamped envelope produces better results than the business reply envelope.
Time of arrival	Not known	The questionnaire sent to the home should arrive near the end of the week.
Format	Not Known	An aesthetically pleasing cover, a title which arouses interest, an attractive page format, a size and style of type easily readable under poor illumination and by people with poor vision and photographs to illustrate the questionnaire.
Selection of respondent	Respondent selection rarely increases returns above a total of 80%	1. Nonreaders and nonwriters excluded from participation increases response rate. 2. Interest in, or familiarity with the topic under investigation is a major factor in determining the rate of return. 3. The better educated are more likely to return questionnaires. 4. Professionals are more likely to return questionnaires.
Follow-up*	50%	More than one follow-up may be needed. Returns may be increased by using double postcards with the most important questions on follow-ups. The telephone can often be used effectively for follow-up. Researchers should find out if respondent needs another copy of the questionnaire (it may have been destroyed or misplaced).
Sponsor	17%	When people know the sponsors of questionnaires, the response is usually better.

Length	22%	Short questionnaires usually produce require higher response rates. A double postcard should produce the best results. However, if the questionnaire is over 10 pages at the minimum, length may cease to be a factor.
Introductory	7%	An altruistic appeal seems to have better results than the idea that the respondent may receive something good from it.
Type of questions	13%	Questionnaires asking for objective information receive the best rate; questionnaires asking for subjective information receive the worst.

[1]/Table extracted from:
Miller, Delbert C., Handbook of Research Design and Social Measurement, 34d ed., David McKay

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Similarly, the regression analysis procedure described in Chapter V should include those variables having association with WTP. The resulting equation, when applied to the population, will automatically control for sample under- or over-representation.

Personal Interviews

In personal interviews questions are asked respondents by interviewers. Personal interviews are usually carried out face-to-face; however, telephone interviews can also be performed.

The chief advantage of personal interviews is the increased control over the question answering situation. This increased control generally results in higher response rates than those obtained in self-administered surveys.

Interviewers can also clarify questionnaire items for respondents. This characteristic typically results in fewer "don't know" or unanswered questions.

Control which the interviewer can exert can also be a major weakness of personal interviews. Interviewer bias — the interviewer who causes a respondent to answer a question in a manner different than he would if the interviewer were not present — is a potential problem which must be addressed and controlled for in any personal interview situation. For example, an interviewer in asking a question about willingness to pay for a recreational facility could communicate -- by intonation, emphasis of wording or gesture -- his own attitude about the value of the recreation facility. This attitude could influence the respondent's bid.

In order to minimize bias, it is essential that interviewers be thoroughly trained to practice good interviewing techniques. Several principles which interviewers should follow are:

(1) Non-controversial dress and appearance. Interviewers should generally try to fit into the surroundings where they will be conducting surveys.

(2) Interviewers should know the questionnaire thoroughly and be able to ask the questions smoothly without hesitation or stumbling. In the CV questionnaire it is particularly important that interviewers be familiar with branching points; places where, if a respondent answers a question one way the interviewer asks one question, and if the respondent answers another way a

different subsequent question is asked. For example, in the initial "stage-setting" group of questions a question might ask if the respondent has experienced problems in using the resource. If the respondent answers "yes" the interviewer continues with questions to obtain more detail about the types of problems encountered. If the respondent answers "no", however, the interviewer branches to another part of the questionnaire. It is also important that interviewers have some general understanding of the concept of CV methodolgy. In particular, it is vital that interviewers know and appreciate the difference between a protest bid and a zero WTP bid.

(3) Interviewers should follow questionnaire wording exactly, and should try to ask the questions in a neutral tone of voice.

(4) Respondents' answers to open-ended questions should be recorded exactly. No attempt should be made to correct grammar, to summarize or paraphrase. Often, it is advisable to include an open-ended question at the end of the questionnaire. This question asks respondents to provide any additional comments or thoughts they might have about the problem or solution under study. This question not only can provide useful information to planners, but can also provide respondents with a more positive attitude toward the interview experience by allowing them to move beyond the constrained answer categories of the questionnaire and into areas in which they may have a personal interest.

(5) Interviewers should know when and how to provide clarification to questions. One of the benefits of personal interviews is the presence of the interviewer and the assistance he can provide in clarifying questions.

However, it is essential that interviewers know the extent to which such clarification can be provided. These limits are usually defined in a set of questionnaire specifications. These specifications contain guidance on how questions can be clarified. For example, in response to a question about employment status a person might indicate that both the categories of "employed full time" and "student" apply. The interview specifications would provide that in cases of multiple categories the interviewer should select the "employed full time" category if it applies.

All interviewers should have a four to eight hour training session in the principles of interviewing and familiarization with the CV questionnaire. The training should take place as a group so interviewers can profit from one another's questions. As part of interviewer training each interviewer should practice the interview with other interviewers and receive critique from the group.

A potential drawback in using face-to-face interviews is cost. Interviewers generally need to be obtained and paid for, there are likely to be transportation expenses getting to and from interviews, etc. These expenses can easily result in personal interviews costing several times more than a mail questionnaire. In Corps CV studies done thus far, personal interview costs have ranged from $35-45 per completed interview.

Since face-to-face interviews are expensive, cost-saving devices should be explored wherever possible. Using volunteer interviewers can reduce staff costs considerably. It might also be possible to arrange for a social science

methodology class at a local college to perform the survey for the experience. Sample designs (e.g. cluster sampling) can be employed which reduce transportation costs.

Telephone Interviews

This form of interviewing reduces the cost of personal interviewing but preserves some of its advantages — primarily the ability to clarify and provide assistance. Response rates are likely to be higher than mail surveys, but lower than face-to-face interviews.

Sample selection can be facilitated by employing random digit dialing procedures in telephone interviews. In this method, a table of random numbers (or a computer program) generates a sample of telephone numbers in the exchanges encompassing the area of interest.

Interviews conducted by telephone should normally only last 10 minutes in order to keep respondent interest. Some CV situations may pose special difficulties for telephone surveys. Respondents may need to visually inspect maps or graphic representations of project features before making WTP bids. In addition, there is a growing reluctance on the part of people to answer questions to people over the phone. In some cases people are suspicious that the questions may be a lead-in to a sales pitch; in others that requests for personal information such as income and employment data could be used for other purposes. Where these difficulties can be surmounted, telephone surveys should offer a valuable and cost effective means of collecting CV information.

Quality Control Procedures

In personal interviews data collection costs are a significant portion of
overall study costs. To ensure that data are of high quality and that funds
for data collection are well spent, data collection quality control procedures
should be implemented. Good quality control procedures would include the
following actions:

(1) Periodically accompany and monitor the performance of interviewers in the
field. In this way the techniques of interviewers can be observed and
critiqued.

(2) Review completed interview forms and critique efforts of interviewers
after the completion of a certain number of interviews (e.g. 25). The purpose
of such a review is to inspect for apparent bias in the type of respondents
being interviewed, apparent bias in WTP bids (e.g. higher proportions of
protest bids or zero bids as compared to average of all other interviewers).
If apparent bias is discovered, corrective action — e.g. additional training
— can be taken.

(3) Conduct interviewer meetings and debriefing sessions to discuss any
problems interviewers are encountering, to clarify interpretations of
questions, and question specifications which are being used.

Normally, it is difficult for one person to supervise and monitor more than four or five field interviewers. If a project requires more than this number of interviewers, a hierarchical structure of field interviewers, field supervisor, and project manager should be designed. Each field supervisor supervises from three to five interviewers and reports to the project manager.

Costs of Surveys

It has generally been found that self-administered surveys cost less than personal surveys to conduct (e.g. see Weiss and Hatry, 1971). This has also been found true in completed Corps CV studies. Table IV-2 presents costs for performing several CV surveys by mail, while Table IV-3 shows costs for conducting a personal interview study. As the tables show, cost per completed CV questionnaire for mail surveys were $19 versus $38 for personal interviews. To date, no Corps CV surveys have been done by telephone. However, studies comparing costs of survey approaches in other contexts suggest that costs for performing telephone interviews would likely fall between those of mail and face-to-face interviews (Weiss and Hatry, 1971; Babbie, 1979).

Survey costs will vary according to the particular circumstances of each study. For example, the ease or difficulty of identifying the population of interest and compiling the sampling frame are factors which can vary considerably from situation to situation.

Mail surveys entail no interviewer costs; however, quality control costs associated with monitoring questionnaire returns can be significant.

Follow-up mailings employed to improve response rates will increase survey expenses by requiring additional time for keeping track of returned questionnaires.

For face-to-face personal interviews, the major variables affecting data collection costs include: (1) the number of interviews which can be performed per day; (2) travel costs associated with obtaining interviews; (3) training costs for interviewers; and (4) quality control costs. Each of these factors is discussed in greater detail below.

(1) Number of Interviews Which Can Be Performed Per Day. The number of interviews which can be performed per day is a prime determinant of labor costs for data collection. Most CV interviews will only last twenty minutes or less; however, the distance between respondents will affect how many interviews can be performed in a day. For example, for beach studies where respondents are close together it is reasonable to assume that interviewers should average two or more interviews per hour. For surveys of the general population in urban areas using cluster sample design it is likely that interviewers should be able to average one or more interviews per hour. For other types of populations (e.g. boaters) which are likely to be geographically dispersed, for non-cluster sample designs or for surveys conducted in rural areas, greater amounts of travel time between interviews will be required. This increase in travel time will reduce the number of interviews which can be performed per day.

(2) Travel Costs Associated With Obtaining Interviews. Related to the factor identified above are travel costs of getting to and from interviews. Mileage and/or per diem costs of interviewers will need to be estimated.

(3) Costs for Training Interviewers. Interviewers should receive four to eight hours of training to familiarize them in the principles of interviewing as well as with the CV interview schedule.

(4) Quality Control Procedures. Time should be allocated to ensure that data being collected are of good quality. Checks should be run to guard against possible bias in the type of respondents selected by interviewers (e.g. overrepresentation of particular age group). Similarly, comparisons among WTP responses obtained by interviewers should be made periodically to ensure that the proportion of protest bids occurring in responses are approximately equal for all interviewers. As noted previously, if a study has more than four or five interviewers it is desirable to have a formal interviewer supervisor to manage data collection efforts and carry out quality control procedures.

For telephone interviews the same considerations apply as for face-to-face interviews, with the exception of travel expenses for interviewers.

Once again it should be emphasized that there are no hard and fast rules for determining survey costs. Since it is likely that factors such as those discussed above will vary according to the circumstances of individual projects, the estimates in Tables IV-2 and IV-3 should only be viewed as gross

approximations of costs. Of more value is the framework for deriving costs estimates which the tables present. By identifying the type of qualifications (and unit cost) of persons necessary to perform the tasks, and the amount of time required to accomplish them, an estimate of survey costs configured to the particular situation can be developed.

Table IV-2. Sample Costs for Conducting CV Mail Surveys (Composite of Five Surveys)

Tasks	(GS-13) Chief	(GS-11) Analyst	(GS-07) Tech.	(GS-05) Clerical	Other Costs	Total Costs
1. Preparation						
a. Questionnaire Development/1	1	3	5			1105
b. Pretest		1	1			237
c. Questionnaire Revision		2	1.5			427
d. Selection of Sampling Frame/2 (Identification of Population, List Generation		2	1			329
e. Sample Size Determination		1.5				212
f. Sample Selection		1.5	1		/4	308
g. Questionnaire Mailing		2	1		2.7	3079
2. Data Collection Monitoring, Quality Control	1			32		2673
3. Data Cleaning, Analysis and Benefit Estimation/3	2.5	12				2203
TOTAL ESTIMATE	4.5	25	10.5	32		$10,623

Number of valid surveys = 550
Cost per valid survey   = $19

Notes:
*   Assumes an overhead rate of 40%.
1/ Involved tailoring generic CV questions to specific situations.
2/ Boater registration lists obtained from the state were used to target boat owners. Voter registration lists supplied by the state were used to identify a general population stratum.
3/ Cumulative distribution method employed to estimate benefits.
4/ Cost of supplies, postage and a booklet on boating which would be sent to those returning a questionnaire.

Table IV-3. Sample Costs for Conducting CV Personal Interview Survey

Tasks	Person Days of Effort/* (GS-13) Chief	(GS-11) Analyst	Other Costs (000s)	Total Costs
1. Preparation				
a. Questionnaire Development/1	2	2		687
b. Pretest	1	1		343
c. Questionnaire Revision		2	/4	283
d. Selection of Sampling Frame/2 (Identification of Population, List Generation)		2.5	1	1354
e. Sample Size Determination		1		142
f. Sample Selection		1		142
g. Preparation of Scope of Work for Data Collection		5	/5	708
2. Data Collection Work for Data Collection	1	10.5	13.5	15188
3. Data Cleaning, Analysis and Benefit Estimation/3	2.5	12		2203
TOTAL ESTIMATE	6.5	37	14.5	$21,050

Number of valid surveys = 560
Cost per valid survey   = $38

Notes:

* Assumes an overhead rate of 40%.
1/ Involved tailoring generic CV questions to specific situations.
2/ Boater registration list obtained from the state; general population survey using cluster sample approach developed by contract.
3/ Cumulative distribution method employed to estimate benefits.
4/ Cost of miscellaneous supplies.
5/ Contract for data collection. Cost computed on basis of assumption of completion of one interview per hour including travel time between interviews. Contractor developed cluster sampling plan to perform general population survey. Cost per completed interview for data collection = $24.10.

Conclusion

Since CV studies rely so heavily on the use of survey data it is essential that the collection of data be performed in such a way to ensure that unbiased responses from a representative sample of the population of interest be obtained. The survey administration approaches described in this chapter can fulfill this requirement, provided that the principles which apply to the particular method are followed.

Chapter V

ANALYSIS OF CONTINGENT VALUE SURVEY DATA

A. Introduction

This chapter describes the analysis of the survey data and the various
techniques that can be used to fit a bid function to the WTP bids. The
purpose of the bid function is to relate the bids to the characteristics of
the survey respondents. It will be used in Chapter VI, along with the
characteristics of the study area population, to estimate a simulated demand
curve for the recreational opportunity described in the CV questionnaire.
Chapter V is organized based on the steps undertaken to analyze the data.
These steps are: (1) display socioeconomic profile of sample respondents and
compare to study area population; (2) analyze zero bids and outliers (3) edit
survey data; and (4) fitt the bid function.

B. Profile of Survey Respondents

Respondents in the CV survey should represent the population of interest to
provide plausible results. To determine the degree to which the sample
represents the study area population, key socioeconomic characteristics should
be compared between the survey respondents and the population. The
characteristics for comparison are elicited in Part C, Background Information,
in the survey questionnaire. These characteristics include income, age, sex,
race, employment, education, and marital status. This information for the
population of interest is obtainable from the Census of Population and
Housing. Significant differences between the survey respondents and the

population of interest may occur when the population of interest is not the general population, as in the case of surveys of boat owners and other specialized recreators. In this case, the representativeness of the sample can be checked by comparison with other surveys of the specialized group, i.e., USFWS Hunting and Fishing Survey, National Outdoor Recreation Survey, Boat Manufacturers data, etc. Differences that do exist may not create problems for estimating benefits, due to the techniques used to fit the bid function and estimate the simulated demand curve.

The characteristics of the survey respondents can be further analyzed by comparisons between groupings of respondents. These groupings would include: (1) users and non-users of outdoor recreational sites; (2) zero and non-zero bidders; and (3) protest and non-protest bidders.[1] A table presenting these comparisons completes a profile of the survey respondents. A discussion of this profile should note significant differences between the groups and any relationship between these differences and the groups' mean bids. The analysis of these differences should be presented in a table with the calculated t-test for differences between means.[2] Significant differences

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[1] Protest bids are zero bids for reasons other than "that is what it is worth to me" or "cost given is greater than the facility is worth to me".

[2]
$$t_{n_1+n_2-2} = \frac{(\bar{x}_1-\bar{x}_2)}{\sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2} \cdot \frac{n_1+n_2}{n_1 n_2}}}$$

where the null hypothesis is that there is no difference between the population means. NOTE: $\bar{x}_1$ = sample mean of characteristic for sample 1; $\bar{x}_2$ = sample means of characteristic for sample 2; s_1^2 = sample variance of characteristic for sample 1; s_2^2 = sample variance for characteristic for sample 2; n_1 = size of sample 1; n_2 = size of sample 2; $n_1 + n_2 - 2$ = degrees of freedom.

between the characteristics of zero and non zero bidders are of particular interest. Based on previous contingent value surveys, non zero bidders are likely to be, on the average, younger, have higher incomes, and participate more in outdoor recreation than zero bidders.[3]

C.   Treatment of Protest Bids and Outliers

The questionnaire is designed to elicit the respondent's reason for any zero bid. Of particular interest are zero bids classed as protests. These should be analyzed to determine if the format of the question elicits excessive protest bids. If excessive protest bids are given to a particular type of question, that question or questionnaire should be reevaluated prior to any further use. In addition, protest bids should not be used in fitting the bid function. One difficulty that may be encountered is when a respondent answers one question, such as use value, with a valid zero or nonzero bid but answers another question with a protest bid. One alternative is simply to eliminate all questionnaires with any protest bid from the data analysis. This may, however, significantly reduce the number of valid questionnaires that can be used to fit the bid function. A preferred alternative is to use all valid bids. This requires the estimation of separate bid functions for each of the types of bids, i.e., user, options, and existence values, due to the different groupings of bids.

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[3]See for example: U.S. Environmental Protection Agency. *A Comparison of Alternative Approaches for Estimating Recreation and Related Benefits of Water Quality Improvements* by William H. Desvousge, V. Kerry Smith, and Matthew P. McGivney. (Washington, D.C.; Government Printing Office, 1983.)

A problem that arises in any analysis of survey data is the treatment of outliers. Fitting a bid function using open-ended or iterative bidding WTP responses requires the use of least squares procedure. In general, the least squares line is very sensitive to data points that lie far from the line. The elimination of outliers will substantially change the estimated coefficients of the best fitting line but will also raise the explanatory power, (i.e., higher R^2), of the fitted line.

There are two problems in determining the treatment of outliers: (1) defining the outlying data points and (2) deciding what to do with the identified outliers. Outliers can arise due to misunderstanding of the bid question, intentionally false bids, data recording errors, and other causes. Defining outliers is basically made by subjective judgement. One method that has been used is to define outliers as those bids greater than 10 standard deviations from the sample mean [Rowe, d'Arge, and Brookshire, 1980]. The choice of 10 standard deviations is entirely arbitrary. An alternative method suggested by Belsley, Kuh, and Welsch [1980] and used by Desvousges, Smith and McGivney, is a statistic that measures the influence of each sample case on the least squares estimates. The procedure deletes each row (case) sequentially and compares the resulting least squares estimators to the estimation obtained with all observations. Thus, the Belsley-Kuh-Welsch statistic, $DFBETA_i$, can be estimated by equation 5.1:

$$(5.1) \quad DFBETA_i = b-b(i) = \frac{(X^TX)^{-1}X^Te_i}{1-h_i}$$

where

   b   = estimated coefficient with all observations included

   b(i)   = estimated coefficient with the ith case deleted

   h_i $= x_i (X^T X)^{-1} x_i^T$

   e_i = ordinary least-squares residuals.

Using $DFBETA_i$ can be cumbersome if more t one explanatory variable is used to detect outliers.

Several methods for identifying outliers are available in the most commonly used statistical package, $SPSS^X$ and SPSS/PC. The Mahalanobis distance measures the distance of cases from the average value of the independent variables. An alternative method of detecting outliers, also available with SPSS, is Cook's distance. This statistic accounts for the effect of the case deletion on the residuals of the remaining cases. A larger Cook's distance identifies a case as an influential point. Although the Cook's distance can identify influential cases, there is no absolute standard to use to determine which of these influential cases are outliers. Belsby-Kuh-Welsch develop a measure similar to the Cook's distance and recommend a cutoff value of 2 p/n : where p is the number of variables and n the number of cases. Thus, if the Cook's distance for a particular case exceeds 2 p/n , that case should be treated as an outlier. In general, however, there is no absolute outlier criterion. Therefore, the analyst must use judgement, as well as influential case identification statistics, to determine outliers.

Once outliers have been identified through the use of one of the approaches suggested above, the next step is deciding what to do with them. If the outliers are the result of data coding or editing errors, the mistakes can be corrected or the outliers omitted on methodological grounds. Some outliers can be eliminated on substantive grounds due to lack of consistency in the questionnaire responses or obvious frivolous responses. For the remaining outliers, one generally accepted approach is to simply recalculate the least-squares line with the outliers removed. Obviously, there is the possibility that the newly calculated regression line will have outliers associated with it. An alternative is to report both the original and outliers-deleted regression lines. This represents a more academic approach but may not be relevant in reporting the results in Corps' studies.

Fitting the Bid Function

A bid function represents the estimation of the model WTP relationship. Based on economic theory, WTP or the maximum individual demand price for a recreational opportunity, is determined by the characteristics of the individual, such as income and age, and the characteristics of the recreational opportunity evaluated. In general, the WTP is a response to a question on the maximum payment for entrance to a particular recreational site. Thus, the bid represents the maximum entrance fee the individual is willing to pay to enjoy any of the recreational facilities at the site. Therefore, unless the questions ask about specific facilities, the WTP bid is only valid when applied to the site as a whole and cannot be used to value a single recreational activity at the site.

Fitting a bid function may not be necessary under some circumstances if the sample is representative of the population of interest. If the sample is representative and no quality alternatives are offered, a sampling distribution method, described in Chapter VI, can be used. Respondents may be asked their WTP for alternative qualities or an on-site survey may be taken under differing quality conditions. Under these situations the bid functions can illuminate the impact of managed and natural quality variations on WTP. In addition, the bid function is useful in determining the existence of starting point and interviewer biases.

The statistical procedures used in the estimation of the bid function depend on the type of question asked in the CV survey. If open-ended or iterative bidding questions are used, a bid function can be estimated using ordinary-least squares. For a single recreational site, the generalized bid function to be estimated can be written as:

$$(5.2) \quad WTP_i = f(D_i, C_i, N_i, S_i)$$

where

WTP_i = the maximum willingness-to-pay by a visitor from origin i for entrance to the site,

D_i = the distance, travel time, or travel cost from origin i to the site,

C_i = the socioeconomic characteristics of visitors from origin i,

N_i = the number of visits per year by visitor from origin i, and

S_i = a measure of the substitutes to the site for visitors from origin i.

All the information necessary to estimate equation (5.2) should be provided by the questionnaire respondents. If multiple sites, multiple possible alternative facilities or multiple quality improvements at a single site are used, these characteristics represent additional explanatory variables. In addition, a similar function can be estimated using the option/existence bids as the dependent variable.

A significant problem that is likely to be encountered in the analysis of the sample data is the presence of multicollinearity. Multicollinearity occurs if the explanatory variables, assumed to be independent, are in fact correlated with another. Each regression coefficient in the classic regression model is assumed to measure the change in the dependent variable per unit change in the explanatory variable, all other variables held constant. A high degree of multicollinearity between explanatory variables, however, implies that a change in one is associated with a change in another. Therefore, the interpretation of the coefficient is quite difficult. The estimates of the regression coefficients and the sum of the squares attributable to each variable are dependent on the other variables in the equation. In addition, the variance of the estimates increases when explanatory variable are interrelated. This high multicollinearity may result in a regression equation with a significant R^2, although none of the coefficients are significantly different from zero. A standard rule of thumb states that multicollinearity is likely to be a problem if the simple correlation between two variables is

larger than the correlation of either or both variables with the dependent variable. The easiest way of determining if multicollinearity is causing problems is to examine the standard errors of the coefficients. If dropping one or more of the variables with high standard errors lowers the standard errors of the remaining variables, multicollinearity is usually the culprit.

If multicollinearity is present when statistically analyzing a model, there is very little that can be done. In the case of CV survey data, however, the stepwise approach can be very useful in looking at the data since there are a large number of possible explanatory variables to include.

Equation (5.3) presents the best fit use bid equation estimated by McConnel (1977) from CV survey data generated from 229 interviews on six beaches in Rhode Island over a 10-day period in 1974:

$$(5.3) \quad \ln \text{WTP}_{ij} = -4.7 + .00001y_i - .0025q_{1j}$$
$$(1.0) \qquad (2.5)^*$$
$$+ .076q_{2j} - .058x_i$$
$$(2.5)^* \qquad (9.3)^*$$

$\bar{R}^2 = .29$

$N = 229$

* significant at $\geq .05$ level

where:

$\ln \text{WTP}_{ij}$ = the natural logarithm of the maximum entrance fee per visit by individuals to beach j,

$$y_i \quad = \text{family income of individual i, in dollars,}$$

$$q_{1j} \quad = \text{congestion at beach j, attendance per acre,}$$

$$q_{2j} \quad = \text{temperature at beach j, degrees Fahrenheit,}$$

$$x_i \quad = \text{per season visits of individual i.}$$

The t-statistics are in parentheses. The signs of the coefficients are in accord with those expected from price theory. As expected from cross-sectional data, the proportion of the variation in ln WTP explained by the independent variables is relatively small: $R^2 = .29$. Unexpectedly, the estimated coefficient of family income is not significant.

The development of the CV method for use by the Corps included three case studies. In one of these case studies, a proposed beach renourishment project, a sample of beach visitors where asked, in an iterative bidding format, their maximum WTP to use the beach in its current state, following the McConnell approach. Equation (5.4) presents the use bid equation estimated from interviews of beach visitors.

(5.4) $\quad WTP_i = -.88411 - .000169\, q_1 + .02382\, q_2$
$$(-1.502) \qquad (1.680)$$

$$\quad - .63128\, x_{1j} + .01968 x_{2i} + .31980\, SP_i$$
$$(-2.932)* \qquad (2.288)* \qquad (3.377)*$$

$$\overline{R}^2 = .130$$

$$n = 171$$

$$F = 6.124$$

* significant at $\geq .05$ level

where

x_{1i} = employment status of individual i; 1 = employed, 0 = not employed

x_{2i} = per season visits of individual i,

SP_i = starting pt of iterative bidding for individual i,

q_1 = congestion at beach, attendance per acre, and

q_2 = temperature at beach, degrees Fahrenheit.

Employment status proved a better estimator of WTP than income, in part due to the significant number of refusals to answer the income question. The linear form of the WTP equation had a higher R^2 than the log linear form. The F-statistics indicates that the null hypothesis, that all the estimated coefficients are equal to zero, can be rejected at a level of significance greater than .01. The significant coefficient for the starting point variable indicates the presence of starting point bias. In all cases where a bid function is fitted from survey data gathered using iterative bidding formats, tests for the existence of starting point bias must be conducted. This generally requires the inclusion of the starting point as an additional explanatory variable. One technique for correcting the WTP estimates for starting point bias, when the starting point coefficient is significant, is to set the value of the starting point at zero when using the estimated equation to make WTP predictions. The zero starting point is usually not used in the actual bidding question, however, and therefore lies below the actual starting points. This can lead to a downward bias in the estimated WTP bids. An alternative is to use the mean starting point in using the fitted bid function to estimate WTP.

Logit Analysis of Close-ended Bids

Both Equation (5.3) and (5.4) represent straight forward applications of
multiple regression techniques to estimate the bid function. Bid functions
can be estimated, using ordinary least squares, from WTP responses generated
from open-ended or interative bidding forms of the CV questionnaire.
Close-ended questions present more difficult, but solvable, estimation
problems. The respondent to a close-ended question is asked to respond, "YES"
or "NO", to the willingness to pay a specified dollar amount for the use of
the described recreational opportunity. A "YES" answer does not imply that
the specified amount is the maximum WTP nor does a "NO" answer imply that the
WTP is zero. The specified dollar amount, the characteristics of individuals,
and the choice can be used to estimate the likelihood or probability that an
individual with given characteristics will answer "YES". These probabilities
can then be used to predict the expected value of the maximum WTP across the
individual characteristic.

In the close-ended question case, the dependent variable is the "YES" or
"NO" response, where YES = 1 and NO = 0. The specified dollar amount and the
individual characteristics become the independent variables. In general, an
ordinary least squares estimation or linear probability model is
unsatisfactory since predicted probabilities may be outside the (0,1) range.
In addition, if the estimated probabilities are restricted to be between 0 and
1, there is no guarantee that the estimated parameters are unbiased.

The difficulties associated with the linear probability model suggest an alternative model specification. The _logit_ model is one alternative that has been used extensively in the estimation of the probabilities of "YES" responses to close-ended contingent value questions.[4] The logit model is based on the cumulative logistic probability function and is specified as the equation:

$$(5.5) \quad P_1 = F(Z_i) = F\left(b_1 + \sum_{j=2}^{m} b_j X_{ij}\right) = \frac{1}{1+\exp\left[-\left(b_1 + \sum_{j=2}^{m} b_j X_{ij}\right)\right]}$$

where:

P_i = the probability that an individual will respond "YES" to a close-ended contingent value question,

$F(Z_i)$ = the cumulative logistic probability function, and

X_{ij} = the j characteristics of the individual and the bid price.

to show how the logit function can be estimated, equation (5.5) can be reduced to a more familiar form. Multiplying both sides by $1 + \exp\text{-}Z_i$ and solving for $\exp\text{-}Z_i$ yields:

$$\exp\text{-}Z_i = \frac{1-P_i}{P_i}$$

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[4]The _probit_ model has been used in the analysis of other types of survey data, such as voting patterns, and can be used in the analysis of contingent value data.
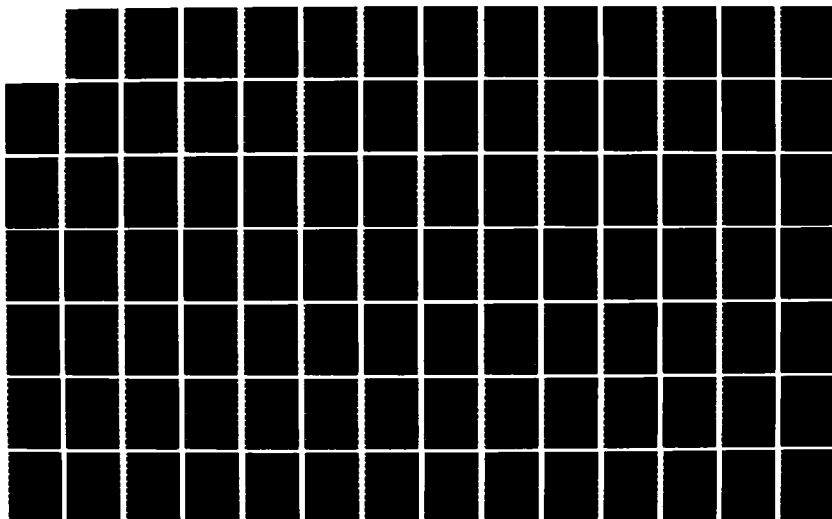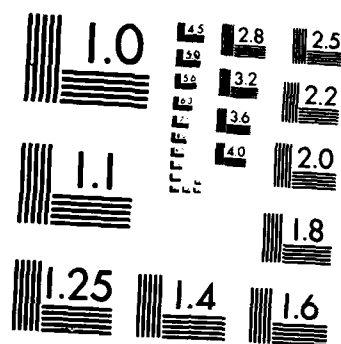
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

Since $\exp - Z_i = 1/\exp Z_i$

$$\exp Z_i = \frac{P_i}{1-P_i}$$

and

$$(5.6) \quad Z_i = \ln \frac{P_i}{1-P_i} = b_1 + \sum_{j=2}^{m} b_j X_{ij}$$

The dependent variable in (5.6) is the natural logarithm of the odds that a particular choice will be made.

Estimation of the logit function shown in (5.5) for individual observation data requires the use of a maximum likelihood technique. There are currently few computer statistical packages that have logit features. Packages that allow the specification of a non-linear equation to be estimated by maximum likelihood can be used, however, and one such package that offers this features is BMDP.[5]

If the survey data is grouped, ordinary least squares can be used to estimate a linear approximation to the logit equation (Pindyck and Rubinfeld, 1981). The basic adjustment is to replace the unknown probability P_i with an estimate. Grouping the individual response survey data into mutually exclusive, collectively exhaustive groups based on the individual characteristics, the frequency of a "YES" response to each bid price for each

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[5]BMDP - Biomedical Computer Programs available on CDC mainframe.

group can be calculated. For instance, assume we have 6 bid prices and 5 income groups and a sample of 300 observations. Let r_{11} represent the number of "YES" responses to bid price BP_1 by individuals with income I_1, and n_{11} the number of individual with income I_1. Then, P_i can be approximately shown as:

(5.7) $\hat{P}_{11} = r_{11}/n_{11}$

So that:

$\hat{P}_{11}$ = fraction of individuals in income category I_1 responding "YES" to bid price BP_1,

$\hat{P}_{12}$ = fraction of individuals in income category I_1 responding "YES" to bid price BP_2 and so on.

The linear approximation to the logit probability model can then be estimated by using $\hat{P}_{ij}$ to approximate P_{ij} so that:

(5.8) $\ln \dfrac{P_{ij}}{1-P_{ij}} \simeq \ln \dfrac{\hat{P}_{ij}}{1-\hat{P}_{ij}} = \ln \dfrac{r_{ij}}{n_{ij}-r_{ij}} = Z_{ij} = B^* + B_2^* BP_{ij} + B_3^* I_j + e_i$

here $\ln$ (.) is the natural logarithm. It is possible for $r_{ij} = n_{ij}$ resulting in the left hand side of (5.7) to be undefined. One adjustment (Cox, 1970 and Domencich and McFadden, 1975) is to add a constant, say 1/2, to both the numerator and denominator of the left hand side of (5.7), so that the equation to be estimated becomes:

$$(5.9) \quad \ln \frac{r_{ij}+1/2}{n_{ij}-r_{ij}+1/2} = Z_{ij} = B_1 + B_2 BP_{ij} + B_3 \cdot I_j$$

Since there are 6 income groups and 5 bid prices, the least squares regression will have 30 observations. The predicted probabilities from the estimated equation (5.8) can be calculated as:

$$(5.10) \quad \hat{P}_{ij} = \exp Z_{ij}/1+\exp Z_{ij}$$

Because the $\hat{P}_{ij}$ represents the cumulative probability of a "YES" response, the incremental probabilities must be used to calculate the expected value of the WTP bid for each income category. Table 5-1 shows an example of the calculation of the expected WTP for one income category. This process would be repeated for all the other income categories.

A significant problem of using grouped data is the increasing number of mutually exclusive, collectively exhaustive groups as the number of categories and characteristics increase. This can create problems with the limited sample sizes in CV surveys. A useful rule of thumb for the application of the least squares approximation to the logit model is that for each group there should be at least 5 observations. In the example above, with only two

Table V-1

Example computation of $E[WTP_i]$ for a Single Income Group

$$Z_{ij} = .056 - .130 \, BP_{ij} + .050 I_j$$

$$P_{ij} = \exp Z_{ij} \, / \, 1 + \exp Z_{ij}$$

$$I_1 = \$20 \text{ (in thousands)}$$

$$BP_{ij} = \text{bid price i offer to individual j}$$

BP_i (1)	Z_i (2)	P_{ij} (3)	Interval P_i (4)	Average interval BP_i (5)	Expected Value Interval BP_i (6) = (4) x (5)
0	–	1.000			
			.400	2.5	1.00
5	.406	.600			
			.161	7.5	1.21
10	-.244	.439			
			.149	12.5	1.86
15	-8.94	.290			
			.114	17.5	1.99
20	-1.544	.176			
			.076	22.5	1.71
25	-2.194	.100			
			.045	27.5	1.24
30	-2.844	.055			
			.026	32.5	0.84
35	-3.494	.029			
			.013	37.5	0.49
40	-4.144	.016			
			.015	50.0	0.75
60	-6.744	.001			

Expected by WTP by individual in Income Group I_1 = $11.09

explanatory variables but 30 groups, this requires a sample size of at least 150. If a third explanatory variable, such as the sex of the respondent, is added, 60 groups are created -- requiring a sample size of at least 300.

The statistical techniques discussed above are applicable to fitting a bid function to the existence value responses. An example of an existence value equation estimated for a small boat project, as part of another case study, is:

$$(5.11) \quad WTP_{EX} = -4.221 + .814_2 + .2501 \ X_3$$
$$\qquad\qquad\qquad\quad (9.413)* \quad (4.263)*$$

$\bar{R}^2 = .288$

* significant at $\geq$ .05 level

where:

WTP_{EX} = dollar value of one-time existence value payment,

X_2 = length of boat in feet, and

X_3 = income in thousands of dollars.

Summary

The purpose of fitting a bid function to the WTP responses is to make inferences about the population of interest from the sample data. The end result is to use the bid function to estimate the NED benefits from the recreational outputs of a water resources investment. Outliers and protest

bidders can be expected from any survey. The data editing procedures suggested above provide a consistent and generally accepted methodology to deal with these problems. The statistical techniques of fitting the bid function to the use and existence value responses provide a means to estimate the value of the recreational outputs for the population of interest. This relationship is then used to estimate a simulated demand curve and the total value of the recreational output. The simulated demand curve is discussed in Chapter VI.

It is possible that none of the possible explanatory variables are significantly different from zero. In this case the analyst must rely on the sample distribution of the WTP values. The sample distribution should represent the population distribution with a truly random sample. Based on this distribution, a simulated demand curve can be approximated. The procedure to be followed if no significant bid function can be fitted to the data is discussed in Chapter VI.

Chapter VI

THE EVALUATION OF THE TOTAL VALUE OF RECREATIONAL OUTPUT

Introduction

This chapter describes the procedures for estimating the value of the recreational site, based on the bid function described in Chapter V. The bid function, along with information about the population of interest, is first used to develop a _simulated demand curve_. These demand curves are referred to as "simulated" since they are not based on actual market behavior, but on behavior in the CV's hypothetical market. The area under this demand curve measures the total value of the recreational output; the total maximum WTP rather than go without the amenity.

The Concept of the Simulated Demand Curve.

The bid function fitted to the survey data in Chapter V is not a demand relationship. Instead, it allows the prediction of the maximum bid price by individuals in the population of interest based on the characteristics of the respondents and the recreational site, if more than one site is surveyed. The concept of a demand, however, describes the relationship between the maximum bid price and quantity demanded. For recreational goods, the market demand curve shows the relationship between the bid price per visit and the number of visitors. Alternatively, the market demand curve may show the relationship between the maximum total payment per year and the number of individuals or households willing to make that payment. For marketed goods, these demand

curves can be estimated directly using data on price, quantity and the other determinants of demand. In the case of nonmarketed goods, the demand curve is typically generated indirectly by building on the individual, all or nothing, demand curve. This indirectly generated demand curve is usually called a simulated demand curve, following Knetsch and Davis (1966).

An all or nothing demand curve is shown in Figure VI-1. It is a step function indicating that as long as the price to use a recreational site does not rise above WTP_0, the individual will continue to visit the site at a fixed rate of use. At any price above WTP_0, the number of visits falls to zero while any price below WTP_0 does not increase the number of visits. This type of relationship is reasonable for vacation and other non-repeat visitors. In addition, it is reasonable when the recreational output offered is fixed in quantity. This would be the case if facilities to store a boat are offered, or if the WTP question determines the maximum yearly or monthly payment to use the recreational site as often as desired. In these instances, the quantity is one individual or one household. The value of WTP_0 is the estimate from the bid function obtained by substituting the values of the individual characteristics, such as income, and site characteristics into the estimated equation.

In those cases where the individual is asked to state his maximum per visit ce and the number of yearly visits, the product of these two amounts can be interpreted to measure the maximum WTP per year. Thus, the individual demand curve would be represented by a figure similar to that shown in Figure VI-1 when the quantity is measured per person or per household. Alternatively, the

FIGURE VI-1
ALL OR NOTHING DEMAND CURVE

WTP_0

PRICE

QUANTITY DEMANDED

$
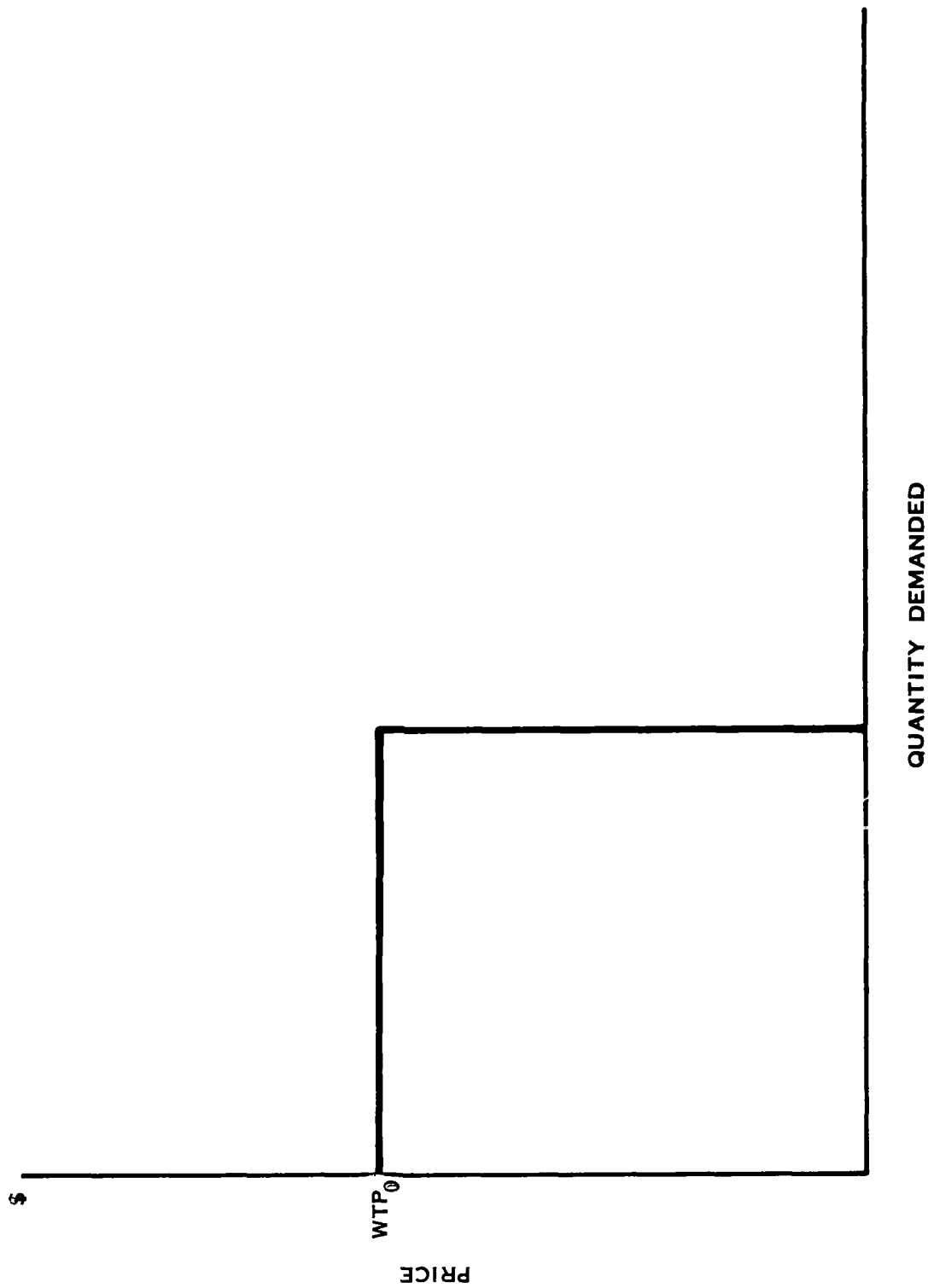
individual demand curve can relate maximum price per visit and number of visits. This relationship is represented by Figure VI-2, indicating that at any price below the maximum, the individual would visit the site more .. ~quently than stated for the maximum price. The truncated portion of this demand curve results from the existence of substitutes. Typically in CV experiments, the impact of offering the good at a price lower than the individual maximum is ignored in determining the total value of the good. Therefore, the value of the recreational good approximated using the step function demand curve represents a lower bound.

Deriving an aggregate demand function from the individual responses is simply a matter of taking the sample distribution function of WTP cumulated on a greater than basis. In other words, a simulated demand curve can be derived by estimating the total number of people in the population of interest who are willing to pay each bid price or greater. The bid price would be varied from the maximum to zero. Thus, at the maximum bid price, no one is willing to pay so high a price and the number of people visiting a site or the number of visits is zero. Decreasing the bid price passes more and more maximum bids and increases the cumulative number of visits. This derivation of the simulated demand schedule is shown in Example 1 below. The distribution of estimated bids is based on the distribution of the predicted bids determined from the fitted bid function described in Chapter V.

Of crucial importance to deriving the simulated demand curve is the number of people in the population of interest. This number, along with the sample distribution of bids, determines the number of bidders at each price.

FIGURE VI-2
INDIVIDUAL DEMAND CURVE WHEN THE NUMBER OF VISITS CAN VARY
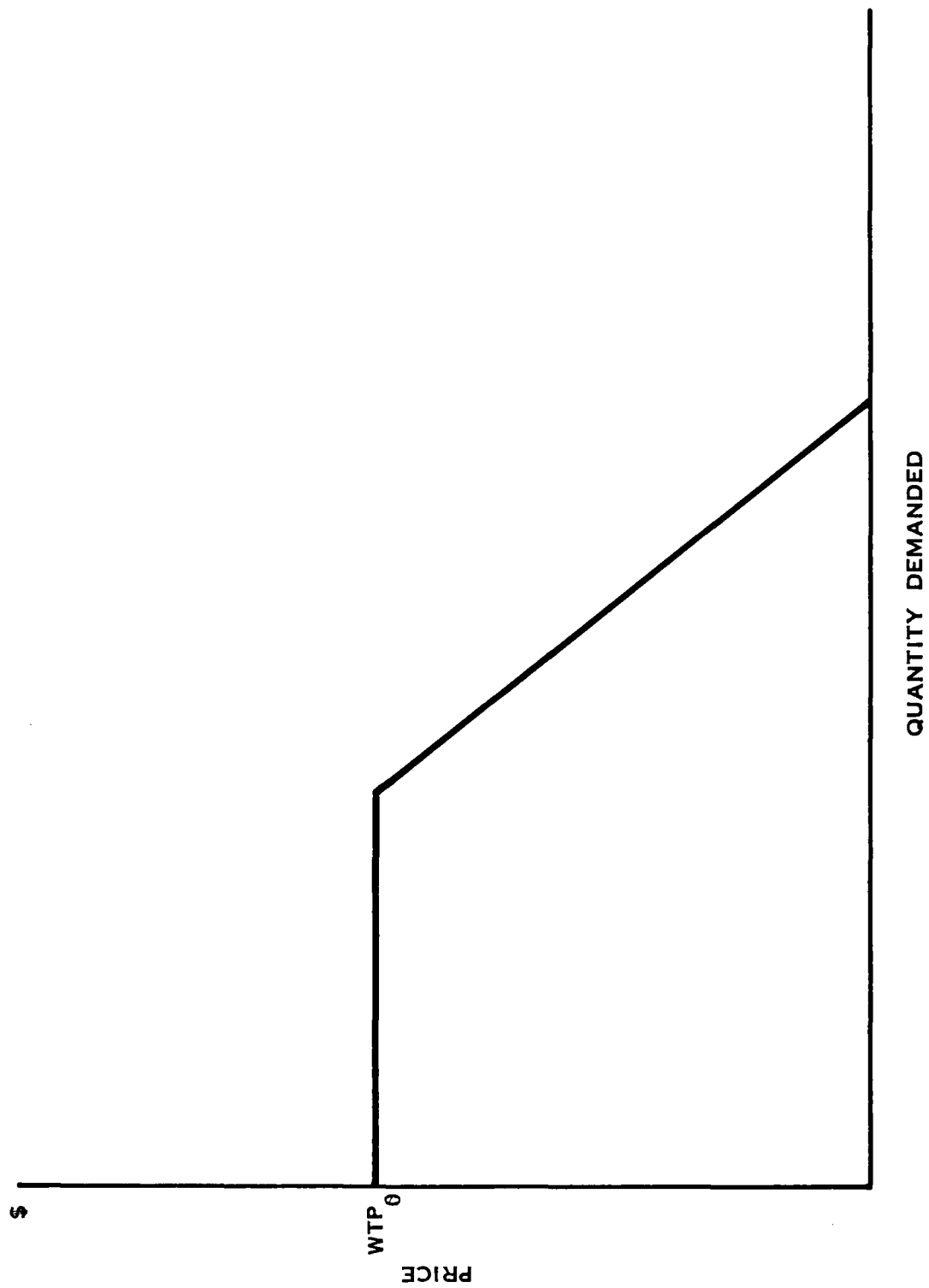
For an improvement to an existing recreational site, the current annual average visitation level provides a lower bound on the number of people for which value is estimated. For a new recreational opportunity, likely visitation information from the CV survey allows an estimate of visitation. The proportion of sample respondents represents an estimate of the proportion of the population of interest that will visit the new site. Therefore, the estimated number of visitors, at a zero price, assuming multiple visits, is the product of the sample proportion of likely visitors and the population of interest. For sites with a per visit bid, the sample distribution of the number of visits can be combined with the population of interest to determine the number of visits at each price. Care must be taken to ensure that the proportion used for each visitation is the proportion of the total sample, not just the proportion of the sample that indicated likely visitation. Example 2 shows the deviation of the simulated demand curve where the bid is in terms of WTP per visit.

Example 1

A proposed Corps project will provide a boat launching ramp. Additional onshore facilities will include restrooms and parking spaces. Based on existing information, it is estimated that 95% of the users of the ramp live within 20 miles of the site of the proposed ramp. From census data, the population within a 20 mile radius of the site is approximately 100,000 people. State boat registrations indicate that there are approximately 2,000 trailered boats owned by this population. A CV survey is conducted on a random sample of the 2,000 boat owners. The minimum sample

size is determined to be 325. Assuming that 85% of all interviews are fully
completed with no refusals or protests, approximately 380 interviews must be
conducted to achieve the required sample size. The WTP question is of the
iterative bidding format determining the maximum amount a boat owner is
willing to pay for an annual launching permit at the described site. The
permit allows the boat owner to launch his boat as often as he wishes during
the year. Following editing of the 340 valid responses, based on procedures
discussed in Chapter V, a bid function of the following form is estimated:

$$WTP_i = B_1 + B_2 X_{2i} + B_3 X_{3i}$$

where:

WTP_i = the maximum bid by respondent i for yearly launch permit, in dollars,

X_{2i} = the length of the boat owned by respondent i, in feet,

X_{3i} = the family income of respondent i, in thousands of dollars.

The results of the estimation of the WTP equation are shown in Table VI-1.

The sample is grouped into 20 mutually exclusive, collectively exhaustive
groups based on 5 boat length classes and 4 income classes. (The number of
classes are to some degree arbitrary, but smaller categories result in more
groups.) If census data is used to made WTP predictions for the population,
the class boundaries should conform to the census class boundaries. The

values for the 20 groups and the number in each group from the sample are shown in Table VI-2. For each of these groups, a prediction of WTP can be made using the estimated coefficients. In addition, a confidence band around each of the predicted values can be constructed by using the standard error of the prediction, calculated as:[1]

$$s^2_{Y_i} = \sum_k (x_{ik} - \bar{x}_k)^2 \; Var \; (\hat{B}_k)$$

$$+ \; 2 \sum_{j<k} (x_{ij} - \bar{x}_j)(x_{ij} - \bar{x}_k) \; Cov \; (\hat{B}_j, \hat{B}_k) + s^2/n$$

for $j, k = 2, 3, \ldots, k; \; j<k,$

where:

$s^2_{Y_i}$ = variance of predicted value of dependent variable for case i,

s^2 = the variance of the regression,

$Var \; (B_k)$ = variance of estimated coefficient B_k,

$Cov(B_{ji}, B_k)$ = covariance of estimated coefficients B_j and B_k

x_{ik} = value of independent variable k for case i,

$\bar{x}_k$ = sample mean of independent variable k, and

n = number of cases.

---

[1] See: Kmenta, (1971) pp. 360-364.

The 95 percent confidence interval around the mean prediction for each group is shown in Table VI-3.

Table VI-4 shows the estimated group bids arranged in descending order and the sample cumulated on a "greater than" basis. For example, Table VI-4 indicates we are 95% confident that 145 boat owners in the sample of 295 are willing to pay between $73 and $130 per year or more for an annual boat launching permit at the new site. The best point estimate of the WTP by those 145 boaters is the mean, $101. Applying the distribution of the proportion of the sample of boaters willing to pay the bid or more for an annual launch permit to the population of 2,000 boat owners yields an estimate of the number of boaters in the population willing to pay the bid or more.[2] The WTP bid and the number of boat owners in the population willing to pay the bid or more represents the simulated demand schedule and, when using the mean bids graphed, the simulated demand curve shown in Figure VI-3. The area under this curve, approximately $206,000, represents the best point estimate of the total yearly value of the boat launch facility to the potential users of the site based on the CV method.

---

[2]For completeness, a confidence interval around the population estimate should be used based on the standard deviation of the sample proportion $s_p = \sqrt{p(1-p)/n} \cdot \sqrt{1-n/N}$ for samples from small population.

Table VI-1

$$WTP = -187.66 + 16.26 \, X_2 + 1.81 \, X_3$$
$$ (-2.46) \quad (8.71) \quad (1.76)$$

$R^2 = 0.285$

$n = 295$

Standard Error of Regression = 223.7

$F = 38.8$

Variances and Covariances of Estimated Coefficients

	B1	B2	B3
B1	5819.33	3.53	-10.37
B2	3.53	3.48	-2.03
B3	-10.37	-2.03	1.06

WTP = Maximum bid for yearly launch permit

X_2 = Length of boat in feet

X_3 = Income in thousands of dollars

Table VI-2

Group	Midpoint Boat Class	Midpoint Class	Sample in Group
1	11	5	10
2	13	5	5
3	15	5	20
4	17	5	30
5	19	5	2
6	11	15	10
7	13	15	15
8	15	15	20
9	17	15	40
10	19	15	8
11	11	25	5
12	13	25	15
13	15	25	30
14	17	25	20
15	19	25	5
16	11	35	5
17	13	35	5
18	15	35	10
19	17	35	30
20	19	35	10
Mean	15.5	19.34	Total 295

Table VI-3

Group	Standard Error of Estimate s_{yi}	Estimated WTP 95% Confidence Interval $X-1.96 \cdot s_{yi}$ Lower	X Mean	$X+1.96 \cdot s_{yi}$ Upper
1	14.003	-27	0	28
2	16.242	1	33	65
3	18.956	28	65	102
4	21.971	55	98	141
5	25.179	81	130	180
6	13.445	-8	18	45
7	12.934	26	51	76
8	13.478	57	33	110
9	14.961	87	116	145
10	17.143	115	148	182
11	19.428	-2	36	75
12	16.816	36	69	102
13	14.695	73	101	130
14	13.302	108	134	160
15	12.876	141	167	192
16	28.038	0	55	110
17	24.703	39	87	135
18	21.499	77	120	162
19	18.494	116	152	188
20	15.801	154	185	216

Table VI-4

Sample Number in Group	Estimated Launch Bid 95% Confidence Interval			Cumulative Number WTP Bid or Greater	Sample Proportion of Cumulation	Estimate of Population WTP Bid or Greater (N = 2,000)
	Lower	Mean	Upper			
0	180	200	220	0	0.00	0
10	154	185	216	10	0.03	68
5	141	167	192	15	0.05	102
10	116	152	188	25	0.08	169
30	115	148	182	55	0.19	373
20	108	134	160	75	0.25	508
20	81	130	180	95	0.32	644
5	77	120	162	100	0.34	678
30	87	116	145	130	0.44	881
15	73	101	130	145	0.49	983
8	55	98	141	153	0.52	1037
5	39	87	135	158	0.554	1071
40	57	83	110	198	0.67	1342
20	36	69	102	218	0.74	1478
30	28	65	102	248	0.84	1681
15	0	55	110	263	0.89	1783
10	26	51	76	273	0.93	1851
5	-2(0)	36	75	278	0.94	1885
5	1(0)	33	65	283	0.96	1919
2	-8(0)	18	45	285	0.97	1932
10	-27(0)	0	28	295	1.00	2000

FIGURE VI-3

SIMULATED DEMAND CURVE FOR BOAT LAUNCHING PASSES (EXAMPLE 1)
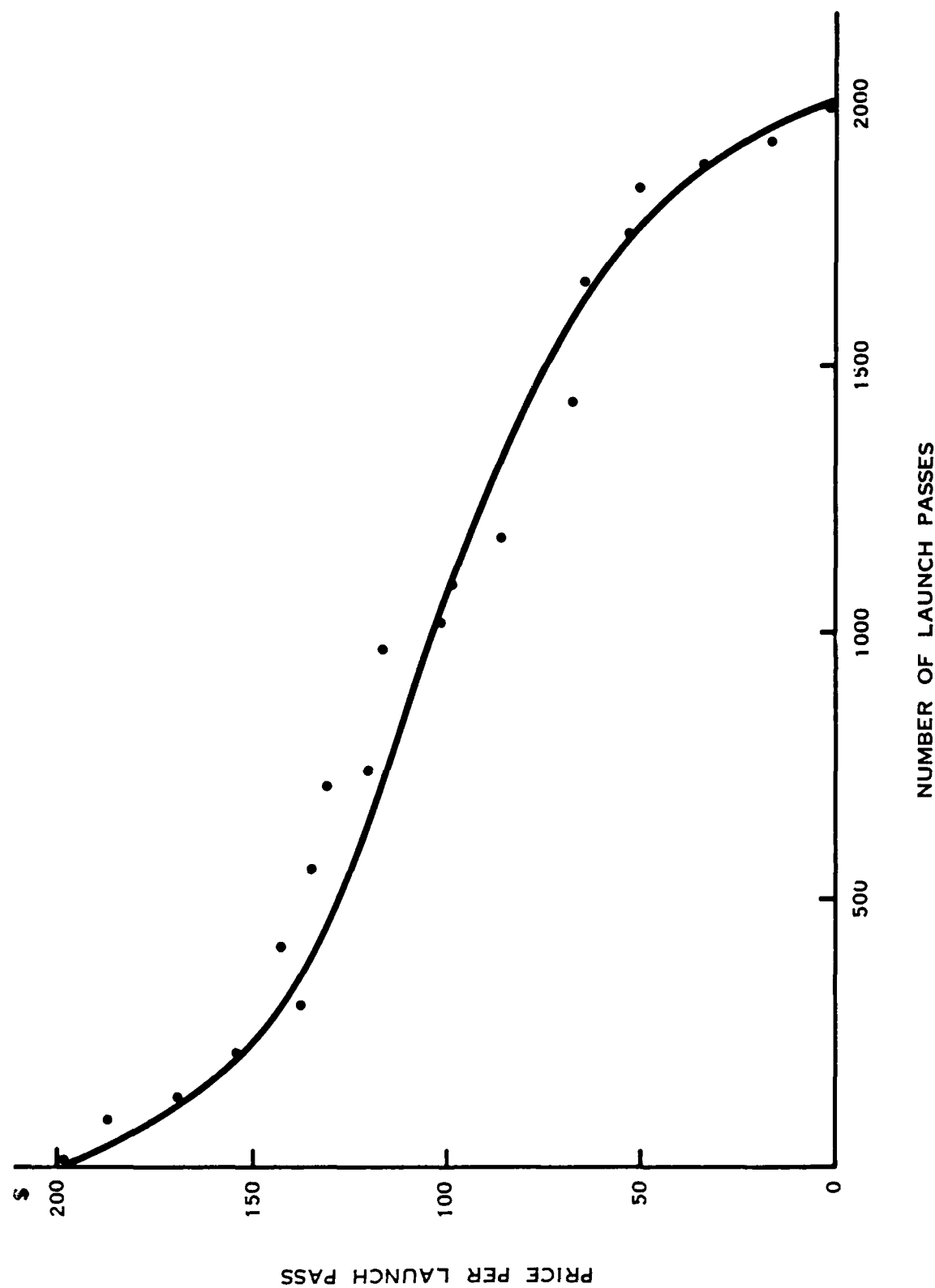
Example 2

A heavily used public beach has experienced significant erosion. The Corps proposes renourishing the beach, expanding its area by 50 percent at all tide levels. A CV survey of beach users is conducted using a random sample of 600 visitors. Two types of questionnaires are used with a minimum sample size of 300 for each questionnaire. Both types of questionnaires collect information on temperature, density of use, and characteristics of users. The Type A questionnaire asks the respondents what is the most they would pay to use the beach per visit and how often they would visit the beach under the existing beach conditions. The Type B questionnaire shows the respondents an artist's conception of the improved beach and asks what is the most they would pay to use the beach per visit and how often they would visit the beach under the improved conditions. There is currently no entrance fee required to use the beach. The survey was conducted over a two-week period near the end of the season. Following editing of the 320 valid responses to the Type A questionnare and 305 valid responses to the Type B questionnaire, two bid functions were estimated. Tables VI-5A through VI-8A show the calculation of the simulated demand schedule and value for the existing conditions: Type A questionnaire. Tables VI-5B through VI-8B show those same calculations for the Type B questionnaire. Figure VI-4 shows those two demand schedules using the mean bids, graphed as simulated demand curves: D_A for existing conditions; D_B for the improved conditions. The areas under these demand curves are $2,616,000 per year for D_A and $3,304,000 per year for D_B.

Deriving the Simulated Demand Schedule Directly from Sample Bid.

In Examples 1 and 2 above, based on the case studies, some of the
characteristics of the users and the site characteristics were found to be
significant in explaining the variation in the WTP bids. As noted at the end
of Chapter V, however, it is possible that none of the possible explanatory
variables will be significantly different from zero. In this case, the sample
distribution of WTP bids provides the best estimate of the population
distribution of bids. The sample can be cumulated on a "greater than" basis
as was done in the examples above, when a bid function is fitted. The sample
proportion of respondents willing to pay the bid, or greater, for the use of a
recreational site, represents an estimate of the population proportion. These
proportions and the size of the population of interest can then be used to
construct a simulated demand curve. Example 3, below, shows the steps
involved in constructing the simulated demand curve directly from the sample
bids.

Example 3

A tidal channel provides access to recreational boating marinas that provide
slip storage for 1,500 boats. Shoaling at the mouth of the channel, as well
as along its course, has severely restricted the use of the channel. Many of
the boats stored in the marinas can only exit the channel at high tide. In
addition, the shoaling in the channel restricts traffic -- resulting in
congestion as well as occasional groundings and collisions. A CV survey is
conducted on a sample of the boat owners storing their boats

Table VI-5A

$$WTP = \underset{(.202)}{0.85} + \underset{(.171)}{0.011} X_2 \underset{(-1.78)}{- 0.0002} S_3$$

$$\underset{(-3.21)}{-0.024} X_4 + \underset{(2.19)}{0.159} X_5$$

$R^2 = 0.265$

$N = 305$

Standard Error of Regression = 1.244

$F = 8.6$

Variances and Covariances of Estimated Coefficients

	B2	B3	B4	B5
B2	4.14E-05	-1.03E-06	-3.90E-02	-4.18E-05
B3	-1.03E-06	1.26E-06	1.57E-01	-1.38E-02
B4	-3.90E-02	1.57E-01	-1.27E-03	5.27E-03
B5	-4.18E-05	-1.38E-02	-1.27E-03	5.29E-03

X_2 = Temperature in degrees Farenheit

X_3 = Density in attendance per acre

X_4 = Visits per person per year

X_5 = Income in thousands

WTP = Maximum bid price per visit

Table VI-6A

Group	Midpoint Visit Class	Midpoint Income Class	Sample Number in Group
1	2	5	40
2	7	5	20
3	12	5	8
4	17	5	15
5	22	5	5
6	2	15	40
7	7	15	15
8	12	15	20
9	17	15	7
10	22	15	7
11	2	25	15
12	7	25	15
13	12	25	10
14	17	25	10
15	22	25	5
16	2	35	30
17	7	35	20
18	15	35	10
19	12	35	10
20	2	35	10
Mean	8.5	18.84	Total 305

Mean temperature = 80 degrees Fahrenheit

Mean density = 920 per acre

Table VI-7A

	Standard Error of Estimate s_{yi}	Estimated WTP 95% Confidence Interval		
Group		$X-1.96 \cdot s_{yi}$ Lower	X Mean	$X+1.96 \cdot s_{yi}$ Upper
1	0.8880	0.0	1	2.4
2	0.9808	0.0	1	.24
3	1.0669	0.0	0.4	2.5
4	1.1478	0.0	0.3	2.5
5	1.2245	0.0	0.2	2.6
6	0.1475	1.9	2.2	2.5
7	0.2613	1.6	2.1	2.6
8	0.3429	1.3	2.0	2.7
9	0.4120	1.1	1.9	2.7
10	0.4739	0.8	1.7	2.7
11	0.5560	2.7	3.8	4.9
12	0.4782	2.8	3.7	4.6
13	0.3886	2.8	3.6	4.3
14	0.2759	2.9	3.5	4.0
15	0.0636	3.2	3.3	3.5
16	1.2848	2.9	5.4	7.9
17	1.2013	2.9	5.3	7.6
18	1.1129	3.0	5.2	7.3
19	1.0182	3.1	5.0	7.0
20	0.9152	3.1	4.9	6.7

Table VI-8A

Sample Number of Visits in Group	Estimated Per Visit Bid 95% Confidence Interval			Cumulative Number of Visits at WTP Bid or Greater	Sample Proportion of Cumulation	Estimate Total Visits at WTP Bid or Greater (N=1,000,000)
	Lower	Mean	Upper			
0	3.5	6.0	8.5	0	0.00	0
60	2.9	5.4	7.9	60	0.02	23952
140	2.9	5.3	7.6	200	0.08	79840
120	3.0	5.2	7.3	3230	0.13	127745
85	3.1	5.0	7.0	405	0.16	161677
220	3.1	4.9	6.7	625	0.125	249501
30	2.7	3.8	4.9	655	0.26	261477
105	2.8	3.7	4.6	760	0.30	303393
120	2.8	3.6	4.3	880	0.35	351297
170	2.9	3.5	4.0	1050	0.42	419162
110	3.2	3.3	3.5	1160	0.46	463074
80	1.9	2.2	2.5	1240	0.50	495010
105	1.6	2.1	2.6	1345	0.54	536926
240	1.3	2.0	2.7	1585	0.63	632735
85	1.1	1.9	2.7	1670	0.67	666667
154	0.8	1.7	2.7	1824	0.73	728144
80	0.00	1	2.4	1904	0.76	760080
140	0.0	1	2.4	2044	0.82	815968
96	0.0	0.4	2.5	2140	0.85	854291
255	0.0	0.3	2.5	2395	0.96	956088
110	0.0	0.2	2.6	2505	1.00	1000000

2505

Total Value Without Project ('000)	$1,698	$2,616	$3,961

Table VI-5B

$$WTP = \begin{array}{cc} -0.851 + \\ (-1.18) \end{array} \quad \begin{array}{c} 0.035\ X_2 \\ (1.82) \end{array} \quad \begin{array}{c} -0.0025\ S_3 \\ (-1.49) \end{array}$$

$$\begin{array}{cc} -0.022\ X_4 \\ (-2.31) \end{array} \quad + \quad \begin{array}{c} 0.205\ X_5 \\ (3.19) \end{array}$$

$R^2 = 0.225$

$N = 320$

Standard Error of Regression = 1.113

$F = 10.7$

Variances and Covariances of Estimated Coefficients

	B2	B3	B4	B5
B2	3.70E–04	–5.65E–07	5.37E–05	1.81E–04
B3	–5.65E–07	2.72E–06	–1.23E–07	–2.18E–06
B4	5.37E–05	–1.23E–07	9.07E–05	3.71E–05
B5	1.81E–04	–2.18E–06	3.71E–05	4.61E–03

X_2 = Temperature in degrees Farenheit

X_3 = Density in attendance per acre

X_4 = Visits per person per season

X_5 = Income in thousands

WTP = Maximum bid price per visit

Table VI-6B

Group	Midpoint Visit Class	Midpoint Income Class	Sample Number in Group
1	2	5	40
2	7	5	20
3	12	5	8
4	17	5	15
5	22	5	5
6	2	15	40
7	7	15	15
8	12	15	20
9	17	15	5
10	22	15	7
11	2	25	15
12	7	25	15
13	12	25	10
14	17	25	10
15	22	25	5
16	2	35	30
17	7	35	20
18	15	35	10
19	12	35	5
20	22	35	10
Mean	8.5	18.84	Total 320

Mean temperature = 80 degrees Fahrenheit

Mean density = 920 per acre

Table VI-7B

| Group	Standard Error of Estimate s_{yi}	Estimated WTP 95% Confidence Interval		
		$X - 1.96 \cdot s_{yi}$ Lower	X Mean	$X + 1.96 \cdot s_{yi}$ Upper
1	0.947091	0.0	1	2.5
2	0.942454	0.0	1	2.4
3	0.940208	0.0	0.4	2.3
4	0.940372	0.0	0.3	2.1
5	0.942943	0.0	0.2	2.0
6	0.278388	2.1	2.7	3.2
7	0.269160	2.0	2.6	3.1
8	0.268197	1.9	2.5	3.0
9	0.275585	1.8	2.4	2.5
10	0.290688	1.7	2.2	2.8
11	0.423766	3.9	4.7	5.6
12	0.422179	3.8	4.6	5.4
13	0.425943	3.7	4.5	5.3
14	0.434919	3.5	4.4	5.3
15	0.448796	3.4	4.3	5.2
16	1.096912	4.6	6.8	8.9
17	1.097990	4.5	6.7	8.18
18	1.101129	4.4	6.6	8.7
19	1.106310	4.3	6.5	8.6
20	1.113506	4.2	6.3	8.5

Table VI-8B

Sample Number of Visits in Group	Estimated Per Visit Bid 95% Confidence Interval			Cumulative Number of Visits at WTP Bid or Greater	Sample Proportion of Cumulation	Estimate Total Visits at WTP Bid or Greater (N=1,000,000)
	Lower	Mean	Upper			
0	5.5	7.5	9.5	0	0.00	0
60	4.6	6.8	7.9	60	0.02	23669
140	4.5	6.7	8.8	200	0.08	78895
120	4.4	6.6	8.7	320	0.13	126233
85	4.3	6.5	8.6	405	0.16	159763
220	4.2	6.3	8.5	625	0.25	246548
60	3.9	4.7	5.6	685	0.27	270217
105	3.8	4.6	5.4	790	0.31	311637
120	3.7	4.5	5.3	910	0.36	358974
170	3.5	4.4	5.3	1080	0.43	426036
110	3.4	4.3	5.2	1190	0.47	469428
80	2.1	2.7	3.2	1270	0.50	500986
105	2.0	2.6	3.1	1375	0.54	542406
240	1.9	2.5	3.0	1615	0.64	637081
85	1.8	2.4	2.9	1700	0.67	670611
154	1.7	2.2	2.8	1854	0.73	731361
80	0.0	1	2.5	1934	0.76	762919
140	0.0	1	2.4	2074	0.82	818146
96	0.0	0.4	2.3	2170	0.86	856016
255	0.0	0.3	2.1	2425	0.96	956607
110	0.0	0.2	2.0	2535	1.00	1000000

2535

Total Value Without Project ('000)	$2,357	$3,304	$4,611

FIGURE VI-4

SIMULATED DEMAND CURVES FOR EXISTING AND IMPROVED BEACH (EXAMPLE 2)
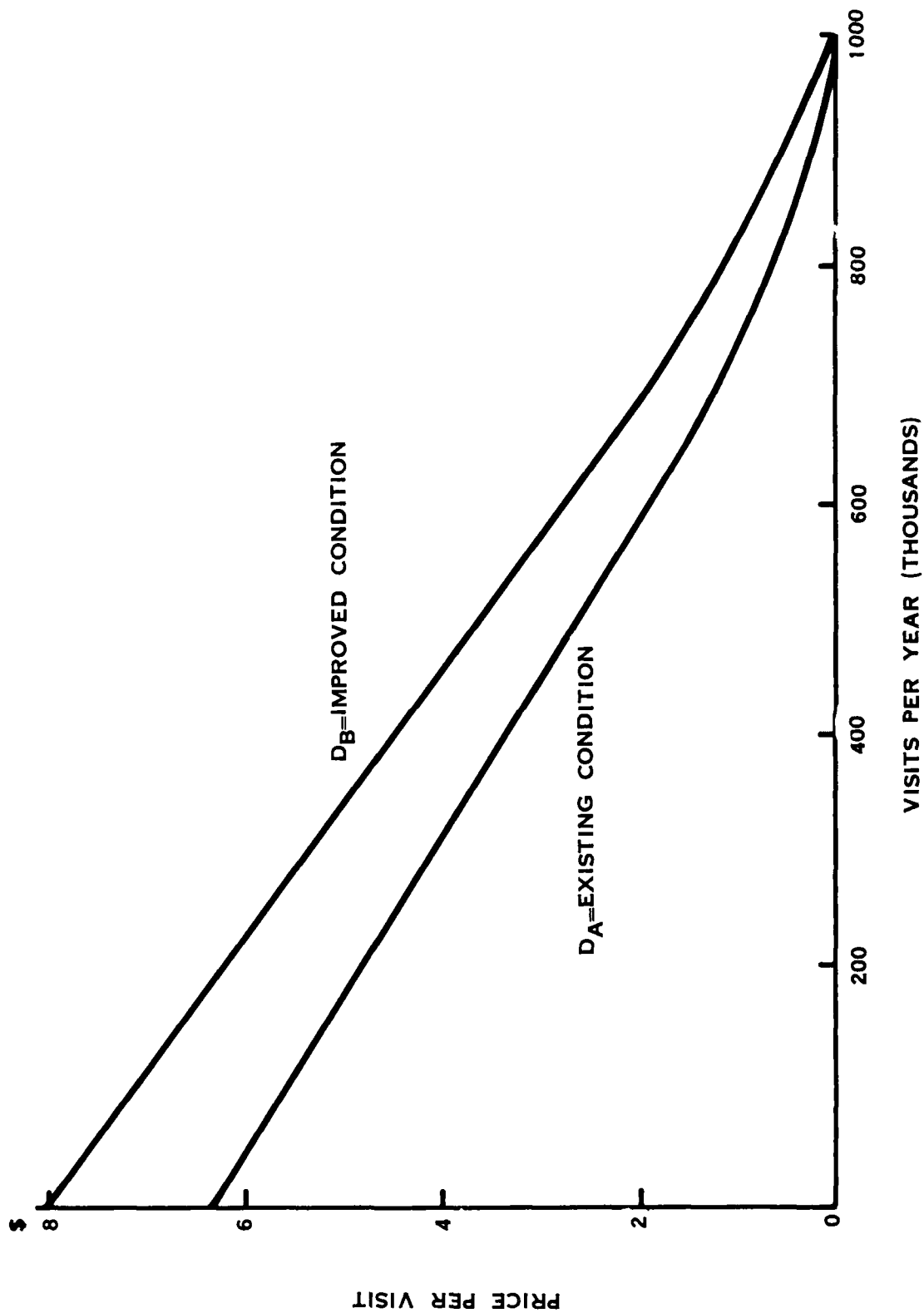
in the marinas accessed by the channel. The WTP question asks each respondent
the maximum he is willing to pay in additional marina storage fees to provide
a safe channel with a minimum depth of 6 feet even at low tide. Of the
original 300 questionnaires, 250 is the sample size after data editing.
Fitting the bid function results in coefficients that have the expected signs,
but none are significantly different from zero even at the 80% level of
confidence. The value of R^2 is less than .10 and the F-statistic is not
significant over the .20 level.

Employing the direct method, the bids are grouped and arrayed in descending
order and the sample is cumulated on a "greater than" basis. The sample
proportion and the estimate of the standard deviation of the population
proportion, $s_p = p(1-p)/n \cdot 1-n/N$, are used to construct a 95% confidence
interval for the population proportion. Based on the population of 1,500 boat
owners in the marinas served by the channel, a simulated demand curve for the
channel improvements can be constructed. Tables VI-9 and VI-10 display the
various steps in the procedure described above, while Figure VI-5 shows the
simulated demand curve using the mean of the number of bidders at each bid
category. The area under this demand curve is approximately $120,000 per
year.

Determining the Zero Price Quantity Demanded

The examples above have implicit assumptions used to determine the number of
individuals using a site or the number of visits to a site at a zero price.
In the boat ramp problem (Example 1), information from the usage of existing

ramps indicated that most users of ramps will travel only short distances to launch their boats. The information that 95% of trailered boat owners travel 20 miles or less to launch their boats was used to define the market area for the new launch facility. The population of boat owners within 20 miles of the new launch ramp is assumed to measure 95% of the potential users of the new site. In the beach renourishment problem (Example 2), it was assumed that beach attendance will not be affected by the expansion in the beach area. Thus, the number of users at a zero price was assumed to be the 10 year average, since the attendance figures displayed no long-term trend. The determination of this zero price use may not always be straightforward, however. The estimate of use will be based on the population of interest within the market area of the project site. Obviously, the population of interest must be determined prior to the actual survey data collection. As part of any CV questionnaire, one question must ask about the likely number of visits, or if the respondent is interested in using the site for outputs such as boat storage facilities. If the population of interest is the total population within the predetermined market area, the sample distribution of visits provides an estimate of the distribution of the participation for the population. Because the market area for a site may be large and participation rates may vary with distance, the market area may have to be subdivided into zones based on distance. The sums of the products of the participation rate and the population for each zone provides an estimate of the zero price visitation.

Table VI-9

| Group	Sample WTP Bid	Number of Respondents Willing to Pay Bid	Number of Respondents Willing to Pay Bid or Greater	Estimated Population Proportion 95% Confidence Interval		
				Lower	Mean	Upper
1	190	0	0	0.000	0.000	0.000
2	180	5	5	0.003	0.020	0.037
3	170	7	12	0.022	0.048	0.074
4	160	9	21	0.050	0.084	0.118
5	150	13	34	0.094	0.136	0.178
6	140	10	44	0.129	0.176	0.223
7	130	7	51	0.154	0.204	0.254
8	120	8	59	0.183	0.236	0.289
9	110	15	74	0.239	0.296	0.353
10	100	15	89	0.297	0.356	0.415
11	90	16	105	0.359	0.420	0.481
12	80	15	120	0.418	0.480	0.542
13	70	15	135	0.478	0.540	0.602
14	60	30	165	0.601	0.660	0.719
15	50	28	193	0.720	0.772	0.824
16	40	10	203	0.764	0.812	0.860
17	30	10	213	0.808	0.852	0.896
18	20	12	225	0.863	0.900	0.937
19	10	5	230	0.886	0.920	0.954
20	0	20	250	1.000	1.000	1.000

Mean Bid $79.12   n = 250

Table VI-10

Estimated Number in Population
Willing to Pay Bid or Greater
95% Confidence Interval

Group	Sample WTP Bid	Lower	Mean	Upper
1	190	0	0	0
2	180	4	30	56
3	170	32	72	112
4	160	74	126	178
5	150	140	204	268
6	140	193	264	335
7	130	231	306	381
8	120	275	354	433
9	110	359	444	529
10	100	445	534	623
11	90	538	630	722
12	80	627	720	813
13	70	717	810	903
14	60	902	990	1078
15	50	1080	1158	1236
16	40	1145	1218	1291
17	30	1212	1278	1344
18	20	1294	1350	1406
19	10	1330	1380	1430
20	0	1500	1500	1500

Estimated Total Value $112,765 $120,630 $128,495

FIGURE VI-5

SIMULATED DEMAND CURVE FOR MARINA SLIPS (EXAMPLE 3)

NUMBER OF BOATOWNERS

WTP PER YEAR
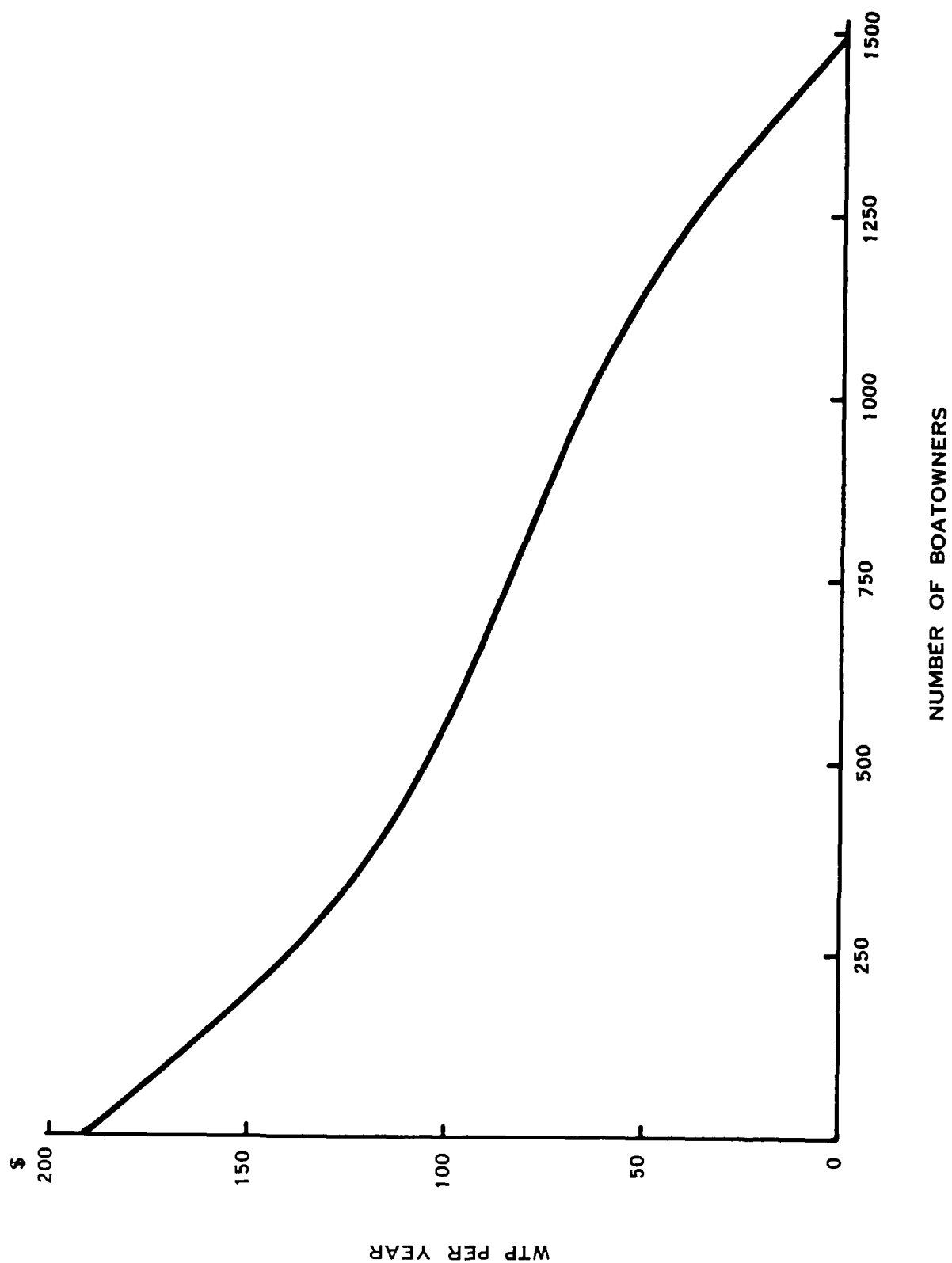
Summary

This chapter described the procedures used to determine the total value of a recreational site to the potential users based on their response to CV questionnaires. These procedures can be also directly applied to the evaluation of the existence value elicited from both users and non-users of the recreational outputs of a site. Although the total value of a recreational site measures the total WTP rather than go without the recreational opportunity of the site, additional adjustments to this value are usually required. In the evaluation of public water resources investments, the analyst must apply the "with-and-without" principle to determine the net change in the value of the recreational outputs resulting from the proposed investment. Therefore, any transfers from existing recreational sites to the proposed new one must be subtracted the determine the NED benefits. Guidance for determining NED benefits is presented in Chapter VII.

Chapter VII

THE DETERMINATION OF NED BENEFITS

The purpose of the CV method is to estimate the NED benefits produced by the introduction of a new recreational opportunity or the improvement in the quality of an existing recreational site. The procedures described in Chapters V and VI allow the estimation of the total value of a recreational opportunity. This value may represent NED benefits under some circumstances. For instance, users of an existing site may be asked their WTP for an improvement to the site. The estimated total value derived from these bids is the NED benefit from the improvements.

This value, however, may not always represent the NED benefits produced by the proposed recreational project. Existing sites, where improvements are being considered, have a value even without the improvements. If respondents are asked the most they would pay to use the improved site, the value represents the value without the improvement plus the value with the improvement. NED benefits, however, are only the increment in value. Therefore, the without-project value must be estimated and subtracted from the with-project value to estimate NED benefits.

Many projects create new recreational opportunities. This new opportunity will, at least to a degree, represent a substitute for existing sites. If respondents are asked the WTP for the new recreational opportunity, the estimated value will include both the incremental value of the new opportunity and as well as the value of the existing opportunity for some respondents.

The use of the new site will result in a decline in use of existing sites. The total NED benefit impact in this case tends to be complex. For instance, it is possible that declining visitation at existing sites may increase the quality and value of the recreational experience of the individual continuing to use the existing sites. This feedback relationship may offset, to a degree, the transfer component of the value of the new site.

The basic solution to the transfer problem is to determine the WTP for the substitute sites with and without the project, as well as the WTP for the new site along with estimates of visitation to the existing site and the new site with the project. These estimates allow evaluation of the value of the existing sites, with and without the project, and the value of the new site. NED benefits can then be estimated by subtracting the value of the existing sites,without the project, from the sum of the values of the existing and new site with the project. There are no instances where this approach has been tried, however.

FIGURE VII-1

DETERMINATION OF NED BENEFITS IF PRICE IS CHARGED FOR BOAT LAUNCH PASS
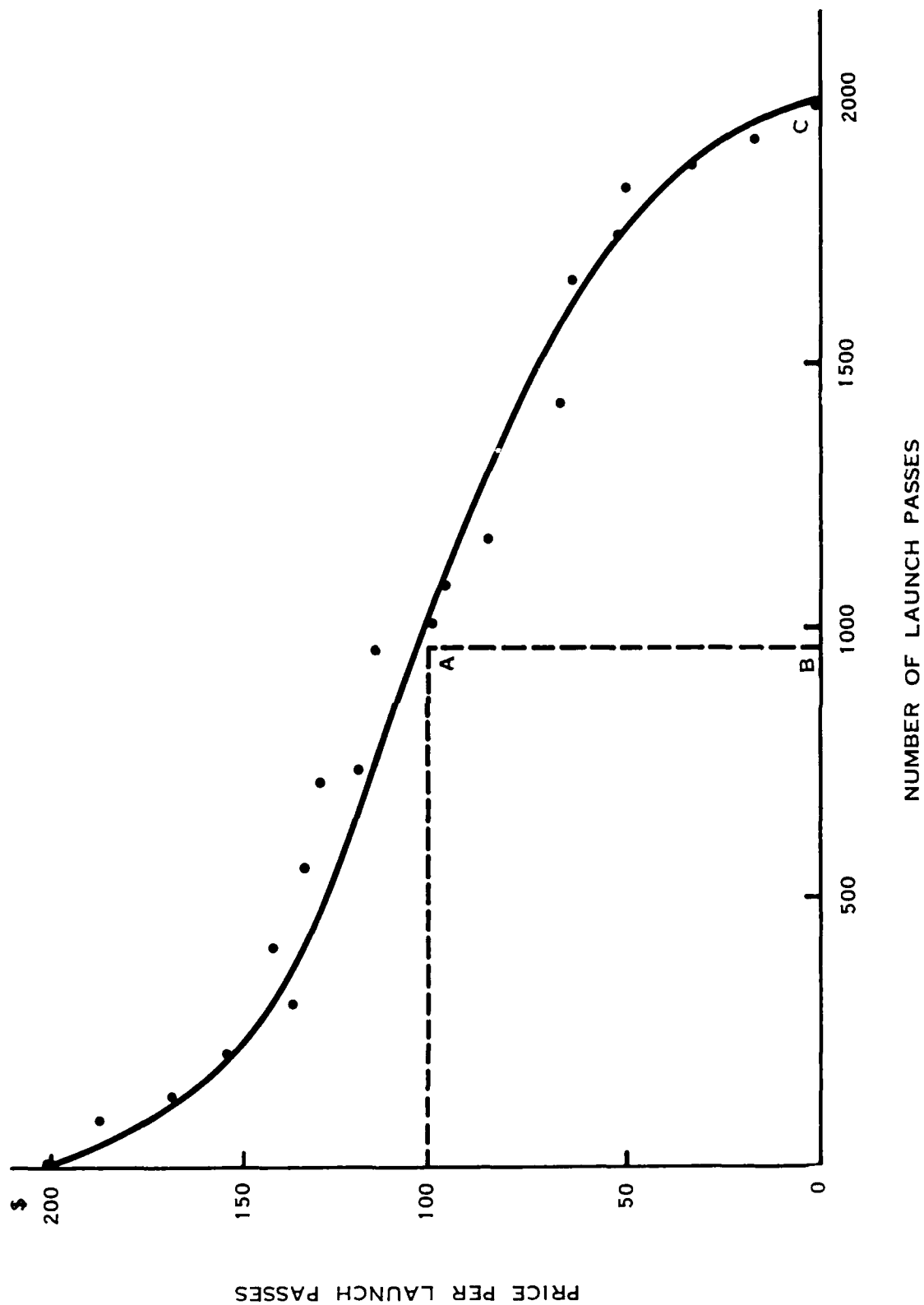
A final complication in the evaluation of NED benefits occurs if fees will be charged for the use of a recreational site. The imposition of user fee will restrict the number of people actually using a site. The portion of the total ⋯⁻ː of the recreational site generated by those individuals who bid less than the proposed fee will not be realized. The impact on NED benefits can best be shown by using the example from Chapter VI.

Example 1 in Chapter VI deals with a boat launch ramp where the WTP refers to an annual launch permit. The simulated demand curve from Figure VI-3 is shown below as Figure VII-1. Assume it is proposed to charge $100 for a yearly launch pass. Thus, the actual realized value from the project is less than the area under the entire demand curve by the area ABC: approximately $206,000 - $64,000 = $142,000.

The beach renourishment project (Example 2) is more complicated since there is currently no entrance fee charged. Figure VI-4 is shown below as Figure VII-2. The triangular shaped area between D_A and D_B represents the NED benefits from the beach improvement if no fee is charged: approximately $680,000 per year. The imposition of a $2 per visit per person user fee with the project will have two impacts on the realized value. The loss in realized benefits compared to the zero price situation is not simply area BDC ($75,000), which is the loss in benefits from the project from those visitors willing to pay less than $2. There is also a loss of area ADC ($225,000), the without-project value of the beach to those visitors excluded by the $2 fee. Therefore, the benefit from the project with a $2 fee is area EFBD - ADC = $388,000.

FIGURE VII-2
DETERMINATION OF NED BENEFITS IF PRICE IS CHARGED TO VISIT IMPROVED BEACH
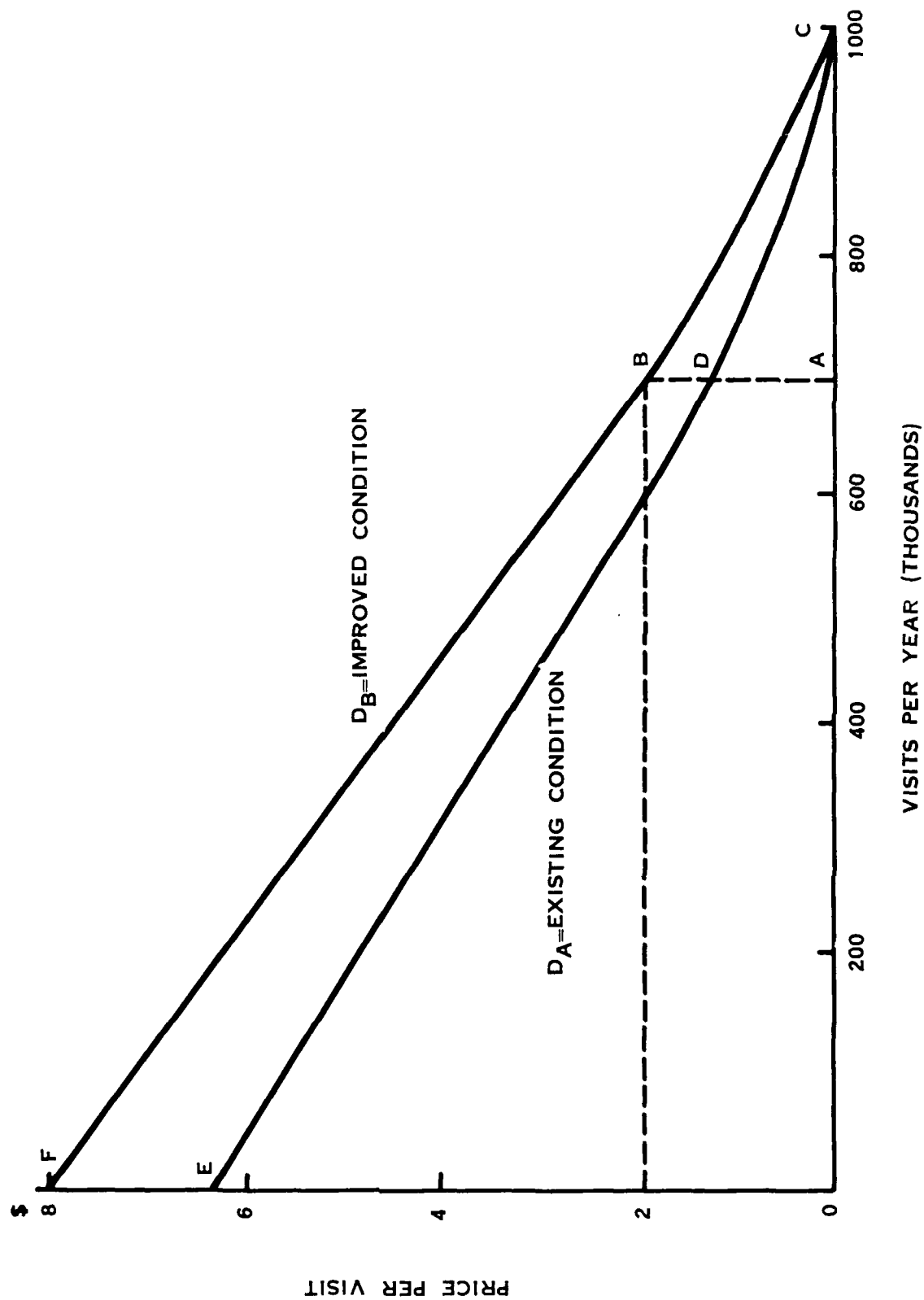
The evaluation of NED benefits presents practical difficulties that may be unique to each project. The basic approach is to apply the "with-and-without" principle to the project value estimates. Accounting for transfer values may be the most difficult problem and may require more information than is necessary to simply evaluate the value of the project. Therefore, it is extremely important that the methodology to be employed in determining NED benefits for a specific project is well thought out prior to the survey.

Selected Bibliography

Babbie, E. 1979. The Practice of Social Research. Second Edition.
 Belmont, California, Wadsworth.

Belsley, D., E. Kuh and R. Welsch. 1980. Regression Diagnostics. New York,
 John Wiley and Sons.

Bishop, R. and T. Heberlein. 1979. Measuring values of extramarket goods:
 are indirect measures biased? Amer. J. Agric. Econ., 61:926-930.

Bishop, R. and T. Heberlein. 1980. Simulated Markets, Hypothetical Markets,
 and Travel Cost Analysis: Alternative Methods of Estimating Outdoor
 Recreation. Staff Paper Series, No. 187. College of Agricualtural and
 Life Sciences. University of Wisconsin, Madison.

Bishop, R., T. Heberlein and M. Kealy. 1983. Contingent valuation of
 environmental assets: comparisons with simulated market. Nat. Res. J.
 23:619-33.

Boyle, K. J., R. C. Bishop, and M.P. Walsh. 1985. Starting point bias in
 contingent valuation bidding games. Land Econ. 61:188-194.

Brookshire, D. and T. Crocker. 1981. The use of survey instruments in
 economic valuations of environmental goods. In: Assessment of Amenity
 Resource Values. U.S.D.A. Forest Service, Rocky Mountain Forest and Range
 Exp. Station. Fort Collins, Colorado.

Brookshire, D. and T. Crocker. 1981. The advantages of contingent valuation
 methods for benefit-cost analysis. Public Choice, 36:235-52.

Brookshire, D., T. Crocker, R. D'Arge, and A. Randall. 1978. Wildlife
 Values: Phase 1 Report. Western Energy and Land Use Team, Office of
 Biological Services, U.S. Fish and Wildlife Service. Fort Collins,
 Colorado.

Brookshire, D., and L. Eubanks. 1978. Contingent valuation and revealing the
 actual demand for public environmental commodities. In: Public Choice in
 New Orleans. Selected papers of the Public Choice Society, New Orleans
 Meeting.

Brookshire, D., A. Randall, and J. Stoll. 1980. Valuing increments and
 decrements in natural resource service flows. Amer. J. Agr. Econ.
 62:478-488.

Brookshire, D., M. Thayer, W. Schulze, adn R. d'Arge. 1982. Valuing public
 goods: a comparison of survey and hedonic approches. Amer. Econ. Rev.
 72:165-77.

Burt, O. and D. Brewer. 1971. Estimation of net social benefits from outdoor
 recreation. Econometrica. 39:813-27.

Clawson, R. and J. Knetsch. 1966. *Economics of Outdoor Recreation.*
Baltimore, Johns Hopkins Press for Resources for the Future.

Cochran, W. G. 1973. *Sampling Techniques.* New York, Wiley.

Cronin, F. 1982. *Valuing Nonmarket Goods Through Contingent Markets.* U.S.
Environmental Protection Agency, Pacific Northwest Laboratory.

Cox, D. R. 1970. *Analysis of Binary Data.* London, Methuen.

Daubert, J. and R. Young. 1981. Recreational demands for maintaining
instream flows: a contingent valuation approach. Amer. J. Agr. Econ.
63:666-676.

Davis, R. 1963. The value of outdoor recreation: an economic study of the
Mainte woods. Ph.D. thesis. Harvard University.

Davis, R. K. 1964. The value of big game hunting in a private forest.
Trans. N.A. Wildl. Nat. Res. Conf. 29:393-403.

Desvousges, W., V. K. Smith, and M. McGivney. 1983. A comparison of
alternative approaches for estimating recreating and related benefits of
water quality improvements. U.S. Environmental Protection Agency.

Dillman, D. 1978. *Mail and Telephone Surveys: The Total Design Method.*
New York, Wiley.

Domencich, T. and D. McFadden. 1975. *Urban Travel Demand: A Behavioral
Analysis.* Amsterdam, North-Holland.

Donnelly, D. M., J. B. Loomis, and C. F. Sorg. 1983. The net economic value
of recreation steelhead fishing in Idaho. U.S.D.A. Forest Service. Rocky
Mountain Forest and Range Exp. Station. Fort Collins, Colorado.

Freeman, A. M. 1984. The sign and size of option value. Land Econ.
60:1-13.

Gordon, I. M. and J. L. Knetsch. 1979. Consumer's surplus measures and the
evaluation of resources. Land Econ. 55:1-10.

Greenley, D., R. Walsh and R. Young. 1981. Option value: empirical evidence
from a case study of recreation and water quality. Quart. J. Econ.
96:657-74.

Gurney, M. 1972. Sampling applications of the 1970 Census publications,
maps, and public use summary files. Bureau of the Census, Technical Paper
27.

Hammack, J. and G. Brown. 19174. Waterfowl and Wetlands: *Toward
Bioeconomic Analysis.* Johns Hopkins Press. Baltimore, Maryland.

Harris, B. S. 1983. Contingent valuation of water pollution contol. J.
Environ. Manage. 19: 199-208.

Kmenta, J. 1971. Elements of Econometrics. New York, Macmillan.

Kish, L. 1965. Survey Sampling. New York, Wiley.

Knetsch, J. L. and R. K. Davis. 1966. Comparisons of methods of recreation evaluation. In: Water Research. A. V. Kneese and S. C. Smith, (ed.). Baltimore, Johns Hopkins Press for Resources for the Future.

Knetsch, J. J. and J. A. Sinden. 1984. Willingness to pay and compensated demand: experimental evidence of an unexpected disparity in measures of value. Quart. J. Econ. 99:508-521.

McConnell, K. 1977. Congestion and willingness to pay: a study of beach use. Land Econ. 53:185-95.

Majid, I., J. A. Sinden, and A. Randall. 1983. Benefit evaluation of increments to existing systems of public facilities. Land Econ. 59:377-392.

Mendelsohn, R. and G. Brown, Jr. 1983. Revealed preference approaches to valuing outdoor recreation. Nat. Res. J. 23:607-18.

Meyer, P. 1974. A comparison of direct questioning methods for obtaining dollar values for public rereation and preservation. Technical Report Series 110. PAC 17-75-6. Environment Canada, Vancouver.

Moser, C. A. 1958. Survey Methods in Social Investigation. London, Heinemann.

Pindyck, R. and D. Rubinfeld. 1981. Econometric Models and Economic Forecasts. New York, McGraw-Hill Book Co.

Randall, A., J. Hoehn, and D. Brookshire. 1983. Contingent valuation surveys for evaluating environmental assets. Nat. Res. J. 23:635-48.

Randall, A., B. C. Ives, and E. Eastman. 1974. Bidding games for valuation of aesthetic environmental improvements. J. Environ. Econ. Manage. 1:132-49.

Rowe, R. and L. Chestnut. 1983. Valuing environmental commodities: revisited. Land Econ. 59:404-10.

Rowe, R. and L. D'Arge, and D. Brookshire. 1980. An experiment on the economic value of visibility. J. Environ. Econ. Manage. 7:1-19.

Schulze, W., R. D'Arge, and D. Brookshire. 1981. Valuing environmental commodities: some recent experiments. Land Econ. 57:151-172.

Seller, C., J. R. Stoll, and J-P. Chavas. 1985. Validation of empirical measures of welfare change: a comparison of nonmarket techniques. Land Econ. 61:156-175.

Stoll, J. R., C. Seller, J-P Chavas, and C. R. Taylor. 1982. Principles and standards, recreation benefits,a dn a comparison of empirical valuation methods. Paper presented a Western Regional Science Association meetings. Santa Barbara, California.

Thayer, M. 1981. Contingent valuation techniques for assessing environmental impacts: further evidence. J. Environ. Econ. Manage. 81:27-44.

Walsh, R., R. Aukerman, and R. Milton. 1980. Measuring benefits and the economic value of water in recreation on high country reservoirs. Complation Report No. 102. Colorado Water Resources Research Institute. Colorado State University. Fort Collins, Colorado.

Walsh, R., P. Ericson, D. Arosteguy, and M. Hansen. 1980. An empirical application of a model for estimating the recreation value of instream flow. Completion Report No. 102. Colorado Water Resoruces Research Institute, Colorado State University. Fort Collins, Colorado.

Walsh, R., J. Loomis, and R. Gillman. 1984. Valuing option, existence, and bequest demands for wilderness. Land Econ. 60:14-29.

Walsh, R. and J. P. Olienyk. 1981. Recreation demand effects of mountain pine beetle damage to the quality of forest recreation resources in the Colorado Front Range. Dept. of Economics, Colorado State University. Fort Collins, Colorado.

Weiss, C. and H. Hatry. 1971. An Introduction to Sample Surveys for Government Managers. Washington, D.C., Urban Institute.

Appendix A

CV Questionnaires for Corps Planning Studies

ADDRESS LABEL

Results Requested   YES   NO

$\square$ $\square$

Survey Questionnaire on Water Based Outdoor Recreation

You have been randomly selected to participate in a study by the U.S. Army Corps of Engineers. The purpose of this study is to determine the needs and desires of people in the (name of area) area for outdoor recreation opportunities.

Your participation is entirely voluntary and you may refuse to answer any question. Because only a small number of people are being selected for the study, the participation of each person selected is extremely important. In completing the questionnaire keep in mind that most of the questions have to do with your attitudes and opinions and there are no right or wrong answers. The information you provide will be kept strictly confidential and will be used only for overall statistical reports. If you would like, we will send you a summary of the results of the study; is so, please check YES in the Results Requested below your address label. The questionnaire should only take about 15 minutes to complete. Thank you for your help.

The first questions deal with the different types of outdoor recreational activities people take part in near lakes and rivers (the ocean) in this area. Below is a list of recreational sites within approximately _____ miles from your home. The pictorial map shows the location of these sites. The table shows the types of recreational activities available at each site and the fee charged, if any.

PICTORIAL MAP

a. Have you visited any of the sites listed above within the last 12 months? PLEASE PLACE AN X IN THE APPROPRIATE BOX.

/__/ YES

/__/ NO

SECTION B

B-1

The next group of questions inquires about your opinions about the recreational facilities at lakes (rivers, beaches, harbors) in your area.

a. In your opinion, are there sufficient facilities in your area for participating in the recreational activities listed below. Consider all recreational sites within ___ miles of your home. PLEASE PLACE AN X IN THE APPROPRIATE BOX FOR EACH ACTIVITY LISTED

RECREATIONAL ACTIVITY/FACILITY LIST	SUFFICIENT FACILITIES ARE AVAILABLE	NOT ENOUGH FACILITIES ARE AVAILABLE	DON'T KNOW

One of the major purposes of this study is to learn how much additional recreational facilities at lakes (rivers, beaches, harbors/oceans) are worth to people in your area. In answering the questions in this section keep in mind there are three ways of thinking about the worth of recreational facilities.

First, these facilities might be worth something to you because they provide recreational activities which you and your family currently use.

Second, it might be worth something to you knowing that these facilities are being maintained for your use should you decide to use them in the future.

Third, it might be worth something to you knowing that these facilities are being maintained even if you never intend to use them. This value may stem from knowing that future generations will be able to enjoy them or simply because you believe that these facilities are "nice to have".

We now want to ask you a few questions about how much additional recreational facilities are worth to you. To help you answer these questions see the photo, drawing, and description of a recreational facility that might be provided for public use which is shown below.

In answering the questions below, please assume the following:

(1) The only way this recreational facility would be provided is if you and others buy an annual pass for admission to the facility. The pass would allow you (and members of your family) to use the facilities as often as you liked during the year.

(2) The money collected from these annual admission passes would be used only to pay the cost of construction and operation of the facility.

(3) The facility would be located within ___ miles of your home.

(4) The existing facilities will continue to be available as they are now.

A-8

Alternative-1:   Open-Ended-Annual Fee

a. What is the maximum amount you would pay for an annual (family) admission
    pass to the recreational facilities shown above?

        $_____ PER YEAR.

b. How many visits per year would you likely make to this facility, if an
    annual (family) admission pass costs the amount you indicated above?

        _____ DAYS PER YEAR.

c. If you answered zero or did not state a monetary value to Question (a)
    above, choose the statement below that best describes your reasons.
    PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON (IF YOU PLACED A MONETARY
    VALUE IN QUESTION (a), PLEASE SKIP THIS QUESTION.)

    /__/ NOT ENOUGH INFORMATION

    /__/ DID NOT WANT TO PLACE DOLLAR VALUE

    /__/ OBJECTED TO WAY QUESTION WAS PRESENTED

    /__/ THAT IS WHAT IT IS WORTH TO ME

    /__/ OTHER (PLEASE SPECIFY) _____

B-3

Alternative-2: Close-Ended-Annual-Fee

a. Would you buy an annual (family) admission pass to the recreational

    facilities shown above if it costs $(ASSIGNED RANDOMLY TO RESPONDENTS) per

    year? PLACE AN X IN THE APPROPRIATE BOX.

    /__/ YES

    /__/ NO

b. Over the course of a year, how often do you think you (and members of

    family) would visit this recreational site if the annual (family) pass

    costs $(DOLLAR AMOUNT GIVEN ABOVE) per year?

    _____ DAYS PER YEAR

c. If you answered "NO" to Question (a) above, choose the statement below

    that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO

    YOUR REASON. (IF YOU ANSWERED "YES" TO QUESTION (a), PLEASE SKIP THIS

    QUESTION.)

    /__/ NOT ENOUGH INFORMATION

    /__/ DID NOT WANT TO PLACE DOLLAR VALUE

    /__/ OBJECTED TO WAY QUESTION WAS PRESENTED

    /__/ THAT IS WHAT IT IS WORTH TO ME

    /__/ OTHER (PLEASE SPECIFY) _____

<u>B-3</u> (Daily Fee)

We now want to ask you a few questions about how much additional recreational facilities are worth to you. To help you to answer these questions see the photo, drawing, and description of a recreational facility that might be provided for public use. These are attached to the end of this questionnaire.

In answering the questions below, please assume that:

(1) The only way this recreational facility would be provided is if you and others pay the costs through daily admission charges.

(2) The money collected would be used only to pay back the costs of construction and pay the operation costs of the facilities.

(3) The facility would be located within ____ miles of your home.

(4) The existing facilities will continue to be available as they are now.

B-3 Alternative-3:   Open-Ended-Daily Fee

a.   What is the maximum daily admission fee you would pay for access for you

     (and your family), to the new recreational facility shown?

          $____ PER DAY

.   now many visits per year would likely make to this facility, if a (family)

     caily admission costs the amount you indicated above?

          _____ VISITS PER YEAR

.   If you answered zero or did not state a monetary value to Question (a)

     above, choose the statement below that best describes your reason. PLEASE

     PLACE AN . IN THE BOX NEXT TO YOUR REASON. (IF YOU PLACED A MONETARY

     VALUE IN QUESTION (a), PLEASE SKIP THIS QUESTION.)

     /__/ NOT ENOUGH INFORMATION

     /__/ DID NOT WANT TO PLACE DOLLAR VALUE

     /__/ OBJECTED TO WAY QUESTION WAS PRESENTED

     /__/ THAT IS WHAT IT IS WORTH TO ME

     /__/ OTHER (PLEASE SPECIFY) _____

<u>B-3</u>

Alternative-4: Close-Ended-Daily Fee

a. Would you buy a single day's admission pass, for you (and your family), to the new recreational facility shown if it costs $(ASSIGNED RANDOMLY TO RESPONDENTS) per visit? PLACE AN X IN THE APPROPRIATE BOX.

/__/ YES

/__/ NO

b. How many visits per year would likely make to this facility, if a (family) daily admission costs the amount indicated above?

_____ VISITS PER YEAR

c. If you answered "NO" to Question (a) above, choose the statement below that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON. (IF YOU ANSWERED "YES" TO QUESTION (a), PLEASE SKIP THIS QUESTION).

/__/ NOT ENOUGH INFORMATION

/__/ DID NOT WANT TO PLACE DOLLAR VALUE

/__/ OBJECTED TO WAY QUESTION WAS PRESENTED

/__/ THAT IS WHAT IT IS WORTH TO ME

/__/ OTHER (PLEASE SPECIFY) _____

B-4 Alternative-1: Annual Membership-Open-Ended

(Use with Annual Fee B-3)

The previous questions were based on your use or possible future use of the new recreational facility shown above. It may also be worth something to you simply knowing this facility exists, even if you never plan to use it. Instead of the annual admission pass, you could purchase an annual "sustaining membership" in the facilities shown above. The funds collected would not entitle you to use the facility but would help to ensure that it would be available for future generations and others who do purchase admission passes. Without your membership and the memberships of others, this facility could not be provided by admission charges alone.

a. What is the maximum amount of money you would pay for an annual sustaining membership in the recreation facility shown above, even if you never use the facility?

    $_____ PER YEAR

b. If you answered zero or did not state a monetary value to Question (a) above, choose the statement below that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON. (IF YOU PLACED A MONETARY VALUE IN QUESTION (a), PLEASE SKIP THIS QUESTION.)

/‾‾/   NOT ENOUGH INFORMATION

/‾‾/   DID NOT WANT TO PLACE DOLLAR VALUE

/‾‾/   OBJECTED TO WAY QUESTION WAS PRESENTED

/‾‾/   THAT IS WHAT IT IS WORTH TO ME

/‾‾/   OTHER (PLEASE SPECIFY) _____

<u>B-4</u> Alternative 2:   Fund-One-Time-Close-Ended
(Use with Annual Fee B-3)

The previous questions were based on your use of the new recreational facility. It may also be worth something to you simply knowing this facility exists, even if you never plan to use it. Instead of the annual admission pass, you could make a once in a lifetime contribution to a fund supporting the facilities shown above. The funds collected would not entitle you to use the facility but would help to ensure that it would be available for future generations and other who do purchase admission passes. Without your contribution and the contributions of others, this facility could not be provided by admission charges alone.

a. Would you make a one-time contribution to a fund supporting the recreational facility shown above, to ensure it is available for the use of others if the minimum contribution is $(ASSIGNED <u>RANDOMLY</u> <u>TO</u> <u>RESPONDENTS</u>)?

/__/ YES

/__/ NO

b. If you answered "NO" to Question (a) above, choose the statement below that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON. (IF YOU ANSWERED "YES" TO QUESTION (a), PLEASE SKIP THIS QUESTION).

/_/ NOT ENOUGH INFORMATION

/_/ DID NOT WANT TO PLACE DOLLAR VALUE

/_/ OBJECTED TO WAY QUESTION WAS PRESENTED

/_/ THAT IS WHAT IT IS WORTH TO ME

/_/ OTHER (PLEASE SPECIFY) _____

B-4   Alternative-3:   Fund-One-Time-Close-Ended

The previous questions were based on your use of the new recreational facility. It may be worth something to you to have the facility provided so it would be available for your future use even though you do not intend to use it now. It may also be worth something to you simply knowing this facility exists for future generations and others even though you will never use it.

To ensure that the facility shown above is provided, you could make a once in a lifetime contribution to a fund supporting the recreational site. The contribution would not entitle you to use the facility, but would help to pay back the costs of construction and operation costs. The money from contributions and admission passes would ensure the recreation facility is available in the future for you and others.

a.   Would you make a one-time contribution to a fund supporting the recreational facility shown above, to ensure it is available for your use and the use of others, if the minimum contribution is $(ASSIGNED RANDOMLY TO RESPONDENTS)?

/___/   YES

/___/   NO

c. If you answered "NO" to Question (a) above, choose the statement below
   that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO
   YOUR REASON. (IF YOU ANSWERED "YES" TO QUESTION (a), PLEASE SKIP THIS
   QUESTION).

   / / NOT ENOUGH INFORMATION

   / / DID NOT WANT TO PLACE DOLLAR VALUE

   / / OBJECTED TO WAY QUESTION WAS PRESENTED

   / / THAT IS WHAT IT IS WORTH TO ME

   / / OTHER (PLEASE SPECIFY) _____

<u>B-4</u> Alternative 4: Membership-Annual-Open-Ended
(Use with Daily Fee B-3)

The previous questions were based on your use of the new recreational facility. It may be worth something to you to have the facility provided so it would be available for your future use even though you do not intend to use it now. It may also be worth something to you simply knowing this facility exists for future generations and others even though you will never use it.

To ensure that the facility shown above is provided, you could purchase an annual membership in the recreation site. The membership would not entitle you to use the facility, but would help to pay back the costs of construction and operation costs. The money from memberships and admission passes would ensure the recreational facility is available in the future for you and others.

a. What is the maximum amount you would pay for an annual membership in the new recreational facility, to ensure it is available for your use and the use of others?

$_____ PER YEAR

b. If you answered zero or did not state a monetary value to Question (a) above, choose the statement below that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON. (IF YOU PLACED A MONETARY VALUE IN QUESTION (a), PLEASE SKIP THIS QUESTION.)

/___/ NOT ENOUGH INFORMATION

/___/ DID NOT WANT TO PLACE DOLLAR VALUE

/___/ OBJECTED TO WAY QUESTION WAS PRESENTED

/___/ THAT IS WHAT IT IS WORTH TO ME

/___/ OTHER (PLEASE SPECIFY) _____

B-4 Alternative 5: Membership-annual-close-ended

(Use with Daily Fee B-3)

The previous questions were based on your use of the new recreational facility. It may be worth something to you to have the facility provided so it would be available for your future use even though you do not intend to use it now. It may also be worth something to you simply knowing this facility exists for future generations and others even though you will never use it.

To ensure that the facility shown above is provided, you could purchase an annual membership in the recreational site. The membership would not entitle you to use the facility, but would help to pay back the costs of construction and operation costs. The money from contributions and admission passes would ensure the recreational facility is available in the future for you and others.

a. Would you purchase an annual membership in the new recreational facility, to ensure it is available for your use and the use of others, if it costs $(ASSIGNED RANDOMLY TO RESPONDENTS)?

/__/ YES

/__/ NO

c. If you answered "NO" to Question (a) above, choose the statement below that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON. (IF YOU ANSWERED "YES" TO QUESTION (a), PLEASE SKIP THIS QUESTION).

/_/ NOT ENOUGH INFORMATION

/_/ DID NOT WANT TO PLACE DOLLAR VALUE

/_/ OBJECTED TO WAY QUESTION WAS PRESENTED

/_/ THAT IS WHAT IT IS WORTH TO ME

/_/ OTHER (PLEASE SPECIFY) _____

(Use with Daily Fee B-3)

The previous questions were based on your use of the new recreational facility. It may be worth something to you to have the facility provided so it would be available for your future use even though you do not intend to use it now. It may also be worth something to you simply knowing this facility exists for future generations and others even though you will never use it.

To ensure that the facility shown above is provided, you could purchase an annual membership in the recreational site. The membership would not entitle you to use the facility, but would help to pay back the costs of construction and operation costs. The money from contributions and admission passes would ensure the recreational facility is available in the future for you and others.

a. What is the maximum one-time contribution you would make to a fund supporting the recreation facility shown above, to ensure it is available for your use and the use of others?

     $_____ ONCE IN LIFE TIME

b. If you answered zero or did not state a monetary value to Question (a) above, choose the statement below that best describes your reason. PLEASE PLACE AN X IN THE BOX NEXT TO YOUR REASON. (IF YOU PLACED A MONETARY VALUE IN QUESTION (a), PLEASE SKIP THIS QUESTION.)

/_/ NOT ENOUGH INFORMATION

/_/ DID NOT WANT TO PLACE DOLLAR VALUE

/_/ OBJECTED TO WAY QUESTION WAS PRESENTED

/_/ THAT IS WHAT IT IS WORTH TO ME

/_/ OTHER (PLEASE SPECIFY) _____

BACKGROUND DATA

A-28

SECTION C

The following information will help our research staff analyze the survey results.

C-1. Which of the following best describes your present employment status? PLACE AN X IN THE APPROPRIATE BOX.

/___/ EMPLOYED FULL-TIME

/___/ EMPLOYED PART-TIME

/___/ RETIRED

/___/ NOT EMPLOYED

/___/ OTHER (SPECIFY) _____

C-2. What is the last grade of regular school that you completed--not counting specialized like secretarial, art, or grade schools? PLACE AN X IN THE APPROPRIATE BOX.

/___/ NO SCHOOL

/___/ GRADE SCHOOL (1-8)

/___/ SOME HIGH SCHOOL (9-11)

/___/ HIGH SCHOOL GRADUATE (12)

/___/ SOME COLLEGE (13-15)

/___/ COLLEGE GRADUATE (16)

/___/ POST GRADUATE (17)

C-3. How would you describe your racial or ethnic background? PLACE AN X IN
THE APPROPRIATE BOX.

/__/ WHITE OR CAUCASIAN

/__/ BLACK OR NEGRO

/__/ OTHER (SPECIFY) _____

C-4. What is your sex? PLACE AN X IN THE APPROPRIATE BOX.

/__/ FEMALE

/__/ MALE

C-5. Counting yourself, how many persons in your household? WRITE NUMBER IN
THE SPACE PROVIDED.

_____ PERSONS

C-6. Below is a list of income categories. PLEASE PLACE AN X next to the
category that best describes the combined income that you (and all other
members of your family) received during (LAST FULL YEAR). Please be
sure to include wages and salaries, or net income from your business and
pensions, dividents, interest, and any other income.

/__/ UNDER 5,000

/__/ $5,000 - $9,999

/__/ $10,000 - $14,999

/__/ $15,000 - $19,999

/__/ $20,000 - $24,999

/__/ $25,000 - $29,999

/__/ $30,000 - $34,999

/__/ $35,000 - $39,999

/__/ $40,000 - $44,999

/__/ $45,000 - $49,999

/__/ $50,000 AND OVER

PART D

Below, please write in any thoughts about the need for recreational facilities and comments about this questionnaire you may have.

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

PERSONAL INTERVIEW

DIRECT QUESTION

A-33

SURVEY QUESTIONNAIRE ON WATER BASED OUTDOOR RECREATION

A. Introduction (READ THE ENTIRE INTRODUCTION)

Hello, I'm (NAME) from (NAME OF ORGANIZATION DOING INTERVIEWS). We are doing a study of outdoor recreational activities people take part in, both near and on water, for the U.S. Army Corps of Engineers. The purpose of this study is to determine the needs and desires of people in the (name of area) area for outdoor recreational opportunities.

Your participation in this study is entirely voluntary and you may refuse to answer any question. Because only a small number of people are being selected for the study, the participation of each person selected is extremely important. Most of the questions have to do with your attitudes and opinions and there are no right or wrong answers. The information you will provide will be kept strictly confidential and will be used only for overall statistical results. If you would like, we will send you a summary of the results of the study.

CHECK APPROPRIATE BOX BELOW AND IF "YES" PRINT RESPONDENTS MAILING ADDRESS. IF "NO" ASK ZIP CODE ONLY.

RESULTS REQUESTED: YES __ NO __

MAILING   _____

        NUMBER/STREET/RFD   APT. NO.

ADDRESS   _____

        CITY/STATE   ZIP

        INTERVIEW START TIME _____AM/PM

The first questions deal with the different types of outdoor recreational activities people take part in, near lakes and rivers (the ocean), in this area. Many of these activities are shown on this card.

GIVE RESPONDENT CARD 1, "ACTIVITY CARD'. (Card shows activities corresponding to hypothetical project).

Please look carefully over the list of activities, keeping in mind that all the activities listed take place near lakes or rivers (the ocean).

ALLOW RESPONDENT TIME TO LOOK AT THE LIST.

a. Within the past 12 months, that is since last (month one year previous), did you take part in any of the activities listed? CIRCLE NUMBER

                YES..............01
                NO...............02 (GO TO B-1)

LEAVE CARD 1 IN FRONT OF RESPONDENT. GIVE RESPONDENT CARD 2, "LIST OF SITES".

Here is a list of recreational sites in this area that provide these recreational opportunities.

GIVE RESPONDENT CARD 3, "PICTORIAL MAP".

And here is a pictorial map showing the location of these sites.

ALLOW RESPONDENT TIME TO LOOK AT THESE CARDS. THESE THREE CARDS SHOULD REMAIN
IN FRONT OF THE RESPONDENT THROUGHOUT THE INTERVIEW.

b. Within the last 12 months, which of the sites listed did you visit?

RECORD SITE CODE ON SITE/ACTIVITY MATRIX.

WHEN RESPONDENT COMPLETES LIST OF SITES, ASK:

c. Are there any other recreational sites that you visited which are not on
    this list? ADD ANY ADDITIONAL SITES TO SITE/ACTIVITY MATRIX.

COMPLETE THE SITE/ACTIVITY MATRIX BY ASKING FOR EACH SITE VISITED:

d. How many days did you spend at (SITE NAME) last year? A PART OF A DAY
    SHOULD BE COUNTED AS 1 DAY.

e. Referring to CARD 1, which of the recreational activities listed did you
    engage in or recreational facilities did you use at this site?

f. In your opinion, what are the major problems, if any, at this site? READ
PROBLEMS LISTED AND RECORD CODE(S).

PROBLEM CODES

OVER-CROWDING.....................01

POOR MAINTENANCE..................02

AESTHETICS (NOISE, ODOR, ETC.)...03

SAFETY............................04

NONE..............................05

SITE/ACTIVITY MATRIX

SITE NAME	SITE CODE	DAYS VISITED	ACTIVITIES/FACILITIES USED										PROBLEMS
			01	02	03	04	05	06	07	08	09	10	
			01	02	03	04	05	06	07	08	09	10	
			01	02	03	04	05	06	07	08	09	10	
			01	02	03	04	05	06	07	08	09	10	
			01	02	03	04	05	06	07	08	09	10	
OTHER			01	02	03	04	05	06	07	08	09	10	
			01	02	03	04	05	06	07	08	09	10	

(Go to B-1)

A-38

B-1 (Rec. Profile: Cont.)

The next group of questions inquiries about your opinions of whether there are sufficient facilities at area lakes (rivers, beaches, harbors) to participate in the recreational activities shown on CARD 1.

IF RESPONDENT HAS CARD 2, GO TO (a) BELOW. IF NOT, GIVE RESPONDENT CARD 2, "LIST OF SITES".

Here is a list of recreational sites in this area that provide these recreational opportunities.

a. I am going to read down the list of recreational activities shown on CARD 1. For each activity, please tell me your opinion of existing recreational facilities as either sufficient facilities, not enough facilities or you don't know. Consider all recreational sites within ____ miles of your home. READ DOWN ACTIVITIES LIST ON CARD 1 AND RECORD RESPONSES ON ACTIVITIES LIST BELOW.

RECREATIONAL ACTIVITY/FACILITY LIST (from CARD 1)	SUFFICIENT FACILITIES ARE AVAILABLE	NOT ENOUGH FACILITIES ARE AVAILABLE	DON'T KNOW

(Go to B-2)

A-39

B-2 (ALTERNATIVE 1)

One of the major purposes of this study is to learn how much recreational facilities at area lakes (rivers, beaches, harbors/oceans) are worth to people in your area. In answering these questions, keep in mind there are three ways of thinking about the worth to you of these facilities. HAND RESPONDENT CARD 4, "VALUE CARD". First, these facilities might be worth something to you because you and your family currently use them. This is shown in Section I of the "VALUE CARD". Second, it might be worth something to knowing that these facilities are being maintained for your use should you decide to use them in the future. This is shown in Section II of the "VALUE CARD". Third, it might be worth something to you knowing that these facilities are being maintained even if you never intend to use them. This value may stem from knowing that future generations will be able to enjoy them or simply because you believe that these facilities are "nice to have". This is shown in Section III of the "VALUE CARD".

a. Is your actual use of a lake (river, beach, harbor) important in deciding how much the facility is worth to you? CIRCLE NUMBER

    YES..........01
    NO...........02

b. Is knowing that these facilities is being maintained, if you decide to use them in the future, important in deciding how much a facility is worth to you? CIRCLE NUMBER

    YES..........01
    NO...........02

c. Is knowing these facilities are there for others important to you? CIRCLE NUMBER

    YES..........01
    NO...........02   (GO TO B-3)

B-2 (ALTERNATIVE 2)

One of the major purposes of this study is to learn how much recreational facilities at lakes (rivers, beaches, harbors/ocean) are worth to people in your area. In answering these questions keep in mind there are three ways of thinking about the worth to you of these facilities. HAND RESPONDENT CARD 4, "VALUE CARD". First, these facilities might be worth something to you because you and your family currently use them. This is shown in Section I of the "VALUE CARD". Second, it might be worth something to you knowing that these facilities are being maintained for your use should you decide to use them in the future. This is shown in Section II of the "VALUE CARD". Third, it might be worth something to you knowing that these facilities are being maintained even if you never intend to use them. This value may stem from knowing that future generations will be able to enjoy them or simply because you believe that these facilities are "nice to have". This is shown in Section III of the "VALUE CARD".

(NO QUESTIONS IN THIS SECTION. PROCEED TO B-3)

USE VALUE

USE/OPTION VALUE

B-3 (Alternative 1: Annual Payment - open-ended)

Now we would like for you to think about the relationship between the availability of a lake (river, beach, harbor/ocean) for recreation and what we all have to pay to provide these facilities. We all pay as taxpayers for public facilities at lakes (rivers, beaches, harbor/oceans). We also pay directly as users of these types of public and private facilities through boat launching fees, licenses, admission charges, camping permit fees, and other use fees. Without the payment of these taxes and fees that support the recreational facilities in your area, these opportunities could not exit.

I want to ask you a few questions about how much additional recreational opportunities are worth to you.

HAND RESPONDENT CARD 5, PHOTOGRAPH (OR ARTIST'S CONCEPTION) SHOWING TYPES OF ACTIVITIES AT THE "HYPOTHETICAL" PROJECT.

To help you answer the following questions, here is a photograph (artist's conception) of a lake (river, beach, harbor/ocean) recreational facility that might be provided for public use. Assume that the only way that this recreational opportunity could be provided is if you and others pay the cost. One way the cost could be paid is by the sale of annual (family) admission passes to the lake (river, beach, harbor) area. The pass would allow you to use all the facilities shown, with no additional charges, as often as you wished during the year. The money collected would be used only to pay back the cost of construction and to pay the operation costs of these facilities. Let us say that these facilities would be located within __ miles of your home.

In answering the following questions, keep in mind that the existing recreational opportunities shown on CARD 2 will continue to be maintained at their current levels. Please base your answers to the next questions on the types of recreational activities you do now and that you might do in the future.

a. This payment card shows different yearly amounts people might be willing to pay for an annual (family) admission pass to the recreational facility shown in CARD 5. HAND RESPONDENT CARD 6, "PAYMENT CARD", AND ALLOW RESPONDENT TIME TO LOOK AT IT.

What is the maximum amount you would pay for an annual (family) admission pass to the facilities shown? Please pick any amount on the card or any other amount you think is appropriate. RECORD AMOUNT.

                    (IF ANY AMOUNT, GO TO B-3.b)

            $_____Dollars (IF ZERO DOLLARS, ASK

Would it be worth something to you (and your family) to have the recreational opportunity described above provided? CIRCLE NUMBER.

                    YES.........01 (GO TO B-4)

                    NO..........02 (GO TO B-5)

b. Over the course of year, how often do you think you (or members of your family) would visit this site if the admission fee was $(DOLLAR AMOUNT GIVEN ABOVE). RECORD NUMBER OF DAYS.

            _____DAYS A YEAR. (GO TO B-4)

B-3 (Alternative 2: Daily Payment – Open-Ended)

Now we would like for you to think about the relationship between the availability of a lake (river, beach, harbor/ocean) for recreation and what we all have to pay to provide these facilities. We all pay as taxpayers for public facilities at lakes (rivers, beaches, harbor/oceans). We also pay directly as users of these types of public and private facilities through boat launching fees, licenses, admission charges, camping permit fees, and other use fees. Without the payment of these taxes and fees that support the recreational facilities in your area, these opportunities could not exist.

I want to ask you a few questions about how much additional recreational opportunities are worth to you.

HAND RESPONDENT CARD 5, PHOTOGRAPH (OR ARTIST'S CONCEPTION) SHOWING TYPES OF ACTIVITIES AT THE "HYPOTHETICAL" PROJECT.

To help answer the following questions, here is a photograph (artist's conception) of a lake (river, beach, harbor/ocean) recreational facility that might be provided for public use. The only way that this recreational opportunity can be provided is if you and others pay the cost. One way the cost could be paid is through annual memberships and daily admission charges. Assume that to buy a daily admission you must first be a "member" at the recreational site. The annual membership gives you the right to purchase as many (family) daily admission passes as you wish during the year. The money collected would be used only to pay back the costs of construction and to pay the operation costs of the facilities described. Let us say that these facilities would be located within ___ miles of your home.

B-3 (Alt. 2: Cont.)

In answering the following questions, keep in mind that the existing recreational opportunities shown on CARD 2 will continue to be available. Please base your answers on the types of recreational activities you do now and that you might do in the future.

a. What is the maximum amount you would pay, as an annual membership fee, for the right to purchase as many daily (family) admission passes as you wished during the year to the recreational facilities shown in CARD 5? RECORD AMOUNT.

$_____DOLLARS (IF ANY AMOUNT, GO TO B-3.b)

(IF ZERO DOLLARS, ASK

Would it be worth something to you (and your family) to have the recreational opportunity described above provided? CIRCLE NUMBER.

YES..........01 (GO TO B-3.b)

NO...........02 (GO TO B-5)

b. If the annual membership fee was $(DOLLAR AMOUNT GIVEN ABOVE EVEN IF ZERO), what is the maximum amount of money you would pay for a (family) single day's admission to the recreational facility shown in CARD 5? RECORD AMOUNT.

$_____DOLLARS (GO TO B-3.c)

c. Over the course of a year, how often do you think you (or members of your family) would visit this site if the membership fee is $(DOLLAR AMOUNT GIVEN IN B-3.a) and the daily admission fee is $(DOLLAR AMOUNT GIVEN IN B-3.b). RECORD NUMBER OF DAYS.

_____DAYS A YEAR. (GO TO B-4.d)

B-3 (Alternative 3: Annual Payment: Closed-Ended)

Now we would like for you to think about the relationship between the availability of a lake (river, beach, harbor/ocean) for recreation and what we all have to pay to provide these facilities. We all pay as taxpayers for public facilities at lakes (rivers, beaches, harbor/oceans). We also pay directly as users of these types of public and private facilities through boat launching fees, licenses, admission charges, camping permit fees, and other use fees. Without the payment of these taxes and fees that support the recreational facilities in your area, these opportunities could not exist.

I want to ask you a few questions about how much additional recreational opportunities are worth to you.

HAND RESPONDENT PHOTOGRAPH (OR ARTIST'S CONCEPTION) SHOWING TYPES OF ACTIVITIES AT THE "HYPOTHETICAL" PROJECT.

To help you answer the following questions, here is a photograph (artist's conception) of a lake (river, beach, harbor/ocean) recreational facility that might be provided for public use. Assume that the only way that this recreational opportunity could be provided is if you and others pay the cost. One way the cost could be paid is by the sale of annual (family) admission passes to the lake (river, beach, harbor) area. The money collected would be used only to pay back the cost of construction and to pay the operation costs of these facilities. Let us say that these facilities would be located within _____miles of your home.

B-3 (Alt. 3: Cont.)

In answering the following questions, keep in mind that the existing recreational opportunities shown on CARD 2 will continue to be maintained at their current levels. Based on the types of recreational activities you do now and that you might do in the future:

a. Would you buy an annual (family) admission pass to the lake (river, beach, harbor) shown in CARD 5 if it costs $(ASSIGNED RANDOMLY TO RESPONDENTS) a year? CIRCLE NUMBER.

        YES...........01 (GO TO B-3.c)

        NO............02 (ASK

Which of the following statements best describes the reason for this answer? READ STATEMENTS AND RECORD ANSWER.

        NOT ENOUGH INFORMATION...................................01
        DID NOT WANT TO PLACE DOLLAR VALUE......................02
        OBJECTED TO WAY QUESTION WAS PRESENTED..................03
        COST GIVEN IS GREATER THAN THE FACILITY IS WORTH TO ME.04
        OTHER (SPECIFY)...05

(GO TO B-3b)

b. Would it be worth something to you (and your family) to have the recreational opportunity shown in CARD 5 provided? CIRCLE NUMBER

        YES...........01 (GO TO B-3.c)

        NO............02 (GO TO B-5)

c. Over the course of year, how often do you think you (or members of your family) would visit this site if the admission fee was $(DOLLAR AMOUNT GIVEN ABOVE). RECORD NUMBER OF DAYS.

        _____Days a year. (GO TO B-4)

A-49
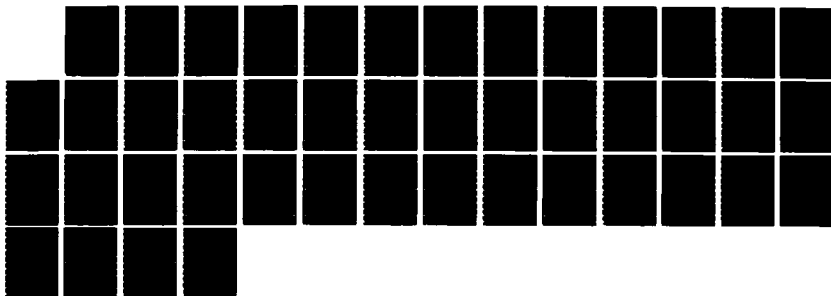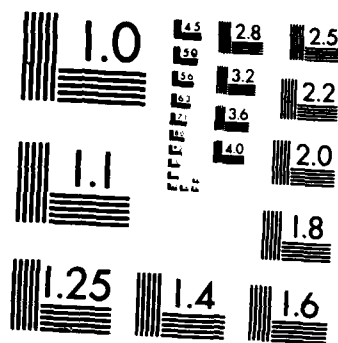
B-3 (Alternative 4: Daily Payment - Closed-Ended)

Now we would like for you to think about the relationship between the availability of a lake (river, beach, harbor/ocean) for recreation and what we all have to pay to provide these facilities. We all pay as taxpayers for public facilities at lakes (rivers, beaches, harbor/oceans). We also pay directly as users of these types of public and private facilities through boat launching fees, licenses, admission charges, camping permit fees, and other use fees. Without the payment of these taxes and fees that support the recreational facilities in your area, these opportunities could not exist.

I want to ask you a few questions about how much additional recreational opportunities are worth to you.

HAND RESPONDENT PHOTOGRAPH (OR ARTIST'S CONCEPTION) SHOWING TYPES OF ACTIVITIES AT THE "HYPOTHETICAL" PROJECT.

To help answer the following questions, here is a photograph (artist's conception) of a lake (river, beach, harbor/ocean) recreational facility that might be provided for public use. The only way that this recreational opportunity can be provided is if you and others pay the cost. One way the cost could be paid is through annual memberships and daily admission charges. Assume that to buy a daily admission you must first be a "member" at the recreational site. The annual membership gives you the right to purchase as many (family) daily admission passes as you wish during the year. The money collected would be used only to pay back the costs of construction and pay the operation costs of the facilities described. Let us say that these facilities would be located within _____ miles of your home.

B-3 (Alt.4: Cont.)

In answering the following questions, keep in mind that the existing
recreational opportunities shown on CARD 2 will continue to be available.
Please base your answers on the types of recreational activities you do now
and that you might do in the future.

a. Would you buy an annual (family) membership to the recreational facility
    shown in CARD 5 if it costs $(RANDOMLY ASSIGNED TO RESPONDENTS) a year?
    CIRCLE NUMBER.

                    YES...........01 (GO TO B-3.c)
                    NO............02 (ASK

    Which of the following statements best describes the reason for this
answer? READ STATEMENTS AND RECORD ANSWER.

        NOT ENOUGH INFORMATION..01
        DID NOT WANT TO PLACE DOLLAR VALUE.............................02
        OBJECTED TO WAY QUESTION WAS PRESENTED.......................03
        COST GIVEN IS GREATER THAN THE FACILITY IS WORTH TO ME.....04
        OTHER (SPECIFY)..05
(GO TO B-3.b)

b. Would it be worth something to you (and your family) to have the
    recreational opportunity shown in CARD 5 provided? CIRCLE NUMBER.

                    YES...........01 (GO TO B-3.c)
                    NO............02 (GO TO B-5)

c. If the annual membership fee was $(SAME AMOUNT AS ABOVE), would you pay
    $(RANDOMLY ASSIGNED TO RESPONDENTS) for a (family) single day's admission
    to the recreational site? CIRCLE NUMBER.

                    YES...........01 (GO TO B-3.d)

                    NO............02 (GO TO B-4).

A-51

B-3 (Alt.4: Cont.)

d. Over the course of a year, how often do you think you (or members of your

    family) would visit this site if the membership fee is $(DOLLAR AMOUNT

    GIVEN IN B-3. a) and the daily admission fee is $(DOLLAR AMOUNT GIVEN IN

    B-3. c). RECORD NUMBER OF DAYS.

                        _____DAYS A YEAR.   (GO TO B-4)

B-4 (Alternative 1: Membership-Annual Payment-Closed Ended)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunity shown in CARD 5 you could purchase an annual "sustaining membership". The funds collected would not entitle the member to admission but would be used, along with admission fees, to pay the costs of providing the facilities. Without your membership and the memberships of others, the facilities shown could not be provided from admission fees alone.

a. Would you buy an annual sustaining membership in the recreation facility shown in CARD 5 if it costs $(RANDOMLY ASSIGNED TO RESPONDENTS) a year, even if you never use the facilities? CIRCLE NUMBER.

           YES...........01 (GO TO C)

           NO............02 (GO TO B-5)

B-4 (Alternative 2: Foundation-Annual Payment-Close Ended)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunities shown in CARD 5 you could make an annual contribution to a foundation established to pay for the recreational facilities. The funds collected would not entitle you to admission to the facilities but would be used, along with admission fees, to pay the costs of providing the facilities. Without your contribution and the contributions of others, the facilities shown could not be provided from admission fees alone.

a. Would you make an annual contribution to the foundation to provide the recreational facility shown in CARD 5 if the minimum contribution is $(RANDOMLY ASSIGNED TO RESPONDENTS) a year, even if you never use the facilities? CIRCLE NUMBER

           YES...........01 (GO TO C)

           NO............02 (GO TO B-5)

B-4 (Alternative 3: Foundation-Annual Payment-Open-Ended)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunities shown in CARD 5 you could make an annual contribution to a foundation established to pay for the recreational facilities. The funds collected would not entitle you to admission to the facilities but would be used, along with admission fees, to pay the costs of providing the facilities. Without your contribution and the contributions of others, the facilities shown could not be provided from admission fees alone.

a. What is the *maximum amount of money you would contribute to the foundation* to construct and maintain the recreational facilities shown in CARD 5 even if you would never use them? WRITE DOLLAR VALUE IN SPACE PROVIDED

$_____per year. (IF ANY AMOUNT, GO TO C)

(IF ZERO, GO TO B-5

B-4 (Alternative 4: Membership-Annual Payment-Open Ended)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help insure the existence of the recreational opportunity shown in CARD 5, you could purchase an annual "sustaining membership". The funds collected would not entitle the member to admission but would be used, along with admission fees, to pay the costs of providing the facilities. Without your membership and the memberships of others, the facilities shown could not be provided from admission fees alone.

a. What is the maximum amount of money you would pay for an annual sustaining membership at the recreation facility shown in CARD 5 even if you would never use the facilities? RECORD AMOUNT.

$_____PER YEAR. (IF ANY AMOUNT, GO TO C)

(IF ZERO, GO TO B-5)

A-57

B-4 (Alternative 5:Foundation – Open-Ended – One Time Payment)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunities shown in CARD 5 you could make a one-time contribution to a foundation established to pay for the recreational facilities. The funds collected would not entitle you to admission to the facilities but would be used, along with admission fees, to pay the costs of providing the facilities. Without your contribution and the contributions of others, the facilities shown could not be provided from admission fees alone.

a. What is the maximum one-time contribution you would make to the foundation to construct and maintain the recreational facilities shown in CARD 5 even if you would never use them? WRITE DOLLAR VALUE IN SPACE PROVIDED

$_____ (IF ANY AMOUNT, GO TO C)

(IF ZERO, GO TO B-5)

B-4 (Alternative 6: Closed Ended – One-Time Payment)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help insure the existence of the recreational opportunity shown in CARD 5 you could make a one-time contribution to a fund established to pay for the recreational facilities. The funds collected would not entitle the contributor to admission but would be used, along with admission fees, to pay the costs of providing the facilities. Without your contribution and the contributions of others, the facilities shown could not be provided from admission fees alone.

a. Would you make a one-time contribution to support the recreational facility shown in CARD 5 if the minimum contribution is $ (RANDOMLY ASSIGNED TO RESPONDENTS), even if you ever use the facilities? CIRCLE NUMBER

> YES...........01 (GO TO C)
>
> NO............02 (GO TO B-5)

PROTEST QUESTIONS

B-5 (Alternative 1 - Open-ended Questions)

We have found in studies of this type that people have a lot of different reasons for answering as they do. Which of the following statements best describes your reason for answering the way you did? READ OFF ALL REASONS AND REPEAT IF NECESSARY. CIRCLE NUMBER

NOT ENOUGH INFORMATION........................01

DID NOT WANT TO PLACE DOLLAR VALUE...........02

OBJECTED TO WAY QUESTION WAS PRESENTED.......03

THAT IS WHAT IT IS WORTH TO ME...............04

OTHER (SPECIFY)..............................05

_____

(GO TO C)

B-5 (Alternative 2 - Close-ended Questions)

We have found in studies of this type that people have a lot of different reasons for answering as they do. Which of the following statements best describes your reason for answering the way you did? READ OFF ALL REASONS AND REPEAT IF NECESSARY. CIRCLE NUMBER

NOT ENOUGH INFORMATION.....................................01

DID NOT WANT TO PLACE DOLLAR VALUE.....................02

OBJECTED TO WAY QUESTION WAS PRESENTED.................03

COST GIVEN IS GREATER THAN THE FACILITY

IS WORTH TO ME 04

OTHER (SPECIFY)..05

_____

(GO TO C)

C. BACKGROUND INFORMATION (OFF-SITE INTERVIEW)

The following information will help our research staff analyze the results of the study properly.

C-1 Which of the following best describes your present status? CIRCLE NUMBER?

EMPLOYED FULL-TIME.........01
EMPLOYED PART-TIME.........02
RETIRED....................03
NOT EMPLOYED...............04
A HOUSEWIFE................05
A STUDENT..................06
OTHER (SPECIFY)............07

_____

C-2 What was the last grade of regular school that you completed--not counting specialized schools like secretarial, art, or trade schools? CIRCLE NUMBER.

NO SCHOOL...................01
GRADE SCHOOL (1-8)..........02
SOME HIGH SCHOOL (9-11).....03
HIGH SCHOOL GRADUATE (12)...04
SOME COLLEGE (13-15)........05
COLLEGE GRADUATE (16).......07
POST GRADUATE (17+)........08
NO RESPONSE/REFUSED.........09

C-3 ASK ONLY IF NOT OBVIOUS. How would you describe your racial or ethnic background? CIRCLE NUMBER

    WHITE OR CAUCASIAN..........01
    BLACK OR NEGRO..............02
    OTHER (SPECIFY).............03

C-4 RECORD SEX OF RESPONDENT.

    MALE.........01
    FEMALE.......02

C-5 What is your current marital status? CIRCLE NUMBER.

    MARRIED......01
    SINGLE.......02

C-6 Including yourself, how many persons are in your household? RECORD ANSWER:

    _____ PERSONS

C-7 Here is a list of age categories. HAND RESPONDENT CARD 7. Would you call off the code number of the category that contains your age. CIRCLE NUMBER.
    CARD 6

    15-19.......01
    20-24.......02
    25-29.......03
    30-34.......04
    35-39.......05
    40-44.......06
    45-49.......07
    50-54.......08
    55-59.......09
    60-64.......10
    65+.........11
    REFUSED.....12

C-8 Here is a list of income categories. HAND RESPONDENT CARD 8. Would you
call off the code number of the category that best describes the combined
income that you (and all other members of your family) received during
(LAST FULL YEAR). Please be sure to include wages and salaries, or net
income from your business, and pensions, dividends, interest, and other
income. CIRCLE NUMBER.

UNDER $5,000......................01

$5,000 - $9,999..................02

$10,000 - $14,999................03

$15,000 - $19,999................04

$20,000 - $24,999................05

$25,000 - $29,999................06

$30,000 - $34,999................07

$35,000 - $39,999................08

$40,000 - $44,999................09

$45,000 - $49,999................10

$50,000 and over 11

NOT SURE/REFUSE..................12

C. BACKGROUND INFORMATION (ON-SITE INTERVIEW)

The following information will help our research staff analyze the
results of the study properly.

C-1 How far, in miles, is it from your home to (NAME OF SITE OF INTERVIEW)?
RECORD ANSWER.

_____MILES

C-2 How far, in miles, did you travel today to get to (NAME OF SITE)?

_____MILES

C-3 How many days do you plan visiting (NAME OF SITE) on this trip? RECORD
ANSWER.

_____DAYS

C-4 What other recreational sites in this area do you intend to visit on this
trip? RECORD ANSWERS.

_____
_____
_____
_____
_____
_____

C-5 How many persons are visiting (NAME OF SITE) with you today? RECORD

NUMBER

_____PERSONS

C-6 Including yourself, how many persons are in your household? RECORD

ANSWER.

_____PERSONS

C-7 Which of the following best describes your present status? CIRCLE

NUMBER?

```
EMPLOYED FULL-TIME.........01
EMPLOYED PART-TIME.........02
RETIRED....................03
NOT EMPLOYED...............04
A HOUSEWIFE................05
A STUDENT..................06
OTHER (SPECIFY)............07
```
_____

C-8 What was the last grade of regular school that you completed--not

counting specialized schools like secretarial, art, or trade schools?

CIRCLE NUMBER.

```
NO SCHOOL....................01
GRADE SCHOOL (1-8)..........02
SOME HIGH SCHOOL (9-11).....03
HIGH SCHOOL GRADUATE (12)...04
SOME COLLEGE (13-15)........05
COLLEGE GRADUATE (16).......06
POST GRADUATE (17+).........07
NO RESPONSE/REFUSED.........08
```

C-9 ASK ONLY IF NOT OBVIOUS. How would you describe your racial or ethnic

background? CIRCLE NUMBER

```
WHITE OR CAUCASIAN..........01
BLACK OR NEGRO..............02
OTHER (SPECIFY).............03
```

C-10 RECORD SEX OF RESPONDENT.

MALE.........01

FEMALE.......02

C-11 What is your current marital status? CIRCLE NUMBER.

MARRIED......01

SINGLE.......02

C-12 Here is a list of age categories. HAND RESPONDENT CARD 7. Would you call off the code number of the category that contains your age. CIRCLE NUMBER.

```
15-19.......01
20-24.......02
25-29.......03
30-34.......04
35-39.......05
40-44.......06
45-49.......07
50-54.......08
55-59.......09
60-64.......10
65+.........11
Refused ....12
```

C-12 Here is a list of income categories. HAND RESPONDENT CARD 8. Would you
call off the code number of the category that best describes the combined
income that you (and all other members of your family) received during
(LAST FULL YEAR). Please be sure to include wages and salaries, or net
income from your business, and pensions, dividends, interest, and other
income. CIRCLE NUMBER.

UNDER $5,000.......................01

$5,000 - $9,999...................02

$10,000 - $14,999.................03

$15,000 - $19,999.................04

$20,000 - $24,999.................05

$25,000 - $29,999.................06

$30,000 - $34,999.................07

$35,000 - $39,999.................08

$40,000 - $44,999.................09

$45,000 - $49,999.................10

$50,000 and over 11

NOT SURE/REFUSE...................12

PART D

We are interested in your thoughts about the need for additional recreational facilities and your comments about this questionnaire. Do you have any comments? RECORD COMMENTS.

_____

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

INTERVIEW STOP TIME _____ AM/PM.

PERSONAL INTERVIEW

ITERATIVE BIDDING

SURVEY QUESTIONNAIRE ON WATER BASED OUTDOOR RECREATION

A. Introduction (READ THE ENTIRE INTRODUCTION)

Hello, I'm (NAME) from (NAME OF ORGANIZATION DOING INTERVIEWS). We are doing a study of outdoor recreational activities people take part in, both near and on water, for the U.S. Army Corps of Engineers. The purpose of this study is to determine people's needs and desires for outdoor recreational opportunities.

Your participation in this study is entirely voluntary and you may refuse to answer any question. Because only a small number of people are being selected for the study, the participation of each person selected is extremely important. Most of the questions have to do with your attitudes and opinions and there are no right or wrong answers. The information you will provide will be kept strictly confidential and will be used only for overall statistical results. If you would like, we will send you a summary of the results of the study.

CHECK APPROPRIATE BOX BELOW AND IF "YES" PRINT RESPONDENTS MAILING ADDRESS. IF "NO" ASK ZIP CODE ONLY.

RESULTS REQUESTED: YES ___   NO ___

MAILING   _____

                   NUMBER/STREET/RFD   APT. NO.

ADDRESS   _____

                   CITY/STATE   ZIP

                   INTERVIEW START TIME _____AM/PM

RECREATION PROFILE

(See Direct Question Person Interview Form)

USE VALUE

USE/OPTION VALUE

B-3 (Alternative 1: Annual Value)

Now we would like for you to think about the relationship between the availability of a lake (river, beach, harbor/ocean) for recreation and what we all have to pay to provide these facilities. We all pay as taxpayers for public facilities at lakes (rivers, beaches, harbor/oceans). We also pay directly as users of these types of public and private facilities through boat launching fees, licenses, admission charges, camping permit fees, and other use fees. Without the payment of these taxes and fees that support the recreational facilities, these opportunities could not exist.

I want to ask you a few questions about how much additional recreational opportunities are worth to you.

HAND RESPONDENT CARD 5, PHOTOGRAPH (OR ARTIST'S CONCEPTION) SHOWING TYPES OF ACTIVITIES AT THE "HYPOTHETICAL" PROJECT.

To help you answer the following questions, here is a photograph (artist's conception) of a lake (river, beach, harbor/ocean) recreational facility that might be provided for public use. Assume that the only way that this recreational opportunity could be provided is if you and others pay the cost. One way the cost could be paid is by the sale of annual admission passes to the lake (river, beach, harbor) area. The pass would allow you to use all the facilities shown, with no additional charges, as often as you wished during the year. The money collected would be used only to pay back the cost of construction and to pay the operation costs of these facilities. Let us say that these facilities would be located within _____ miles of where we are now.

In answering the following questions, keep in mind that the existing recreational opportunities shown on CARD 2 will continue to be maintained at their current levels. Based on the type of recreational activities you do now and that you might do in the future.

B-3 (Alt. 1: Cont.)

a. Would you buy an annual (family) admission pass to the lake (river, beach,
    harbor) recreational facilities shown in CARD 5 if it costs $(INITIAL
    VALUE) a year? CIRCLE NUMBER

    ------------------YES.............01

    ¦   NO.............02-------------------

    ¦   ¦

    ¦   ¦

    ¦   ¦

    IF YES, INCREASE DOLLAR AMOUNT   IF NO, DECREASE THE DOLLAR AMOUNT

    IN $___INCREMENTS UNTIL A "NO"   IN $___INCREMENTS UNTIL A "YES"

    IS GIVEN. WHEN A "NO" ANSWER   ANSWER IS GIVEN. WHEN A "YES" IS

    IS GIVEN, RECORD DOLLAR   GIVEN, RECORD DOLLAR AMOUNT

    AMOUNT OF LAST "YES" ANSWER

                            (IF ANY AMOUNT, GO TO B-3.b)

              $_____ (IF ZERO DOLLARS IS FINAL AMOUNT, ASK

                                                                    ¦

        Would it be worth something to you (and your family) to have the

    recreational opportunity described above provided? CIRCLE NUMBER

                        YES...............01 (GO TO B-3, b)

                        NO...............02 (GO TO B-5)

b. Over the course of year, how often do you think you (or members of your
    family) would visit this site if the admission fee was $(DOLLAR AMOUNT
    GIVEN ABOVE). RECORD NUMBER OF DAYS.

                    _____DAYS A YEAR. (GO TO B-4)

Now we would like for you to think about the relationship between the availability of a lake (river, beach, harbor/ocean) for recreation and what we all have to pay to provide these facilities. We all pay as taxpayers for public facilities at lakes (rivers, beaches, harbor/oceans). We also pay directly as users of these types of public and private facilities through boat launching fees, licenses, admission charges, camping permit fees, and other use fees. Without the payment of these taxes and fees that support the recreational facilities in your area, these opportunities could not exist.

I want to ask you a few questions about how much additional recreational opportunities are worth to you.

HAND RESPONDENT CARD 5, PHOTOGRAPH (OR ARTIST'S CONCEPTION) SHOWING TYPES OF ACTIVITIES AT THE "HYPOTHETICAL" PROJECT.

To help answer the following questions, here is a photograph (artist's conception) of a lake (river, beach, harbor/ocean) recreational facility that might be provided for public use. The only way that this recreational opportunity can be provided is if you and others pay the cost. One way the cost could be paid is through annual memberships and daily admission charges. Assume that to buy a daily admission you must first be a "member" at the recreational site. The annual membership gives you the right to purchase as many (family) daily admission passes as you wish during the year. The money collected would be used only to pay back the costs of construction and to pay the operation costs of the facilities described. Let us say that these facilities would be located within _____ miles of where we are now.

B-3 (Alt. 2: Cont.)

In answering the following questions, keep in mind that the existing recreational opportunities shown on CARD 2 will continue to be available. Please base your answers on the types of recreational activities you do now and that you might do in the future.

a. Would you purchase an annual (family) membership in the river recreational

   facilities shown in CARD 5 if a membership costs ($ INITIAL VALUE) a year?

   Remember, the membership only gives you (and members of your family) the

   right to enter the site if you pay an additional admission fee each day

   you visit the site. CIRCLE NUMBER.

   --------------------YES.............01

   | NO.............02--------------------

   | |

   | |

   | |

IF YES, INCREASE DOLLAR AMOUNT   IF NO, DECREASE THE DOLLAR AMOUNT

IN $____INCREMENTS UNTIL A "NO"   IN $____INCREMENTS UNTIL A "YES"

IS GIVEN. WHEN A "NO" ANSWER   ANSWER IS GIVEN. WHEN A "YES" IS

IS GIVEN, RECORD DOLLAR   GIVEN, RECORD DOLLAR AMOUNT

AMOUNT OF LAST "YES" ANSWER

                        (IF ANY AMOUNT, GO TO B-3.b)

        $_____ (IF ZERO DOLLARS IS FINAL AMOUNT, ASK

   Would it be worth something to you (and your family) to have the

recreational opportunity described above provided? CIRCLE NUMBER

                        YES................01 (GO TO B-3, b)

                        NO................02 (GO TO B-5)

b. Once you are a member, you must purchase an admission pass for each day
you use the recreational facilities. If the cost of an annual membership
is $(FINAL DOLLAR VALUE GIVEN ABOVE EVEN IF ZERO), would you buy a single
day's (family) admission pass if it costs $(INITIAL VALUE) per day?
CIRCLE NUMBER.

-------------------YES.............01

           NO.............02-------------------

IF YES. INCREASE DOLLAR AMOUNT   IF NO, DECREASE THE DOLLAR AMOUNT

IN $____INCREMENTS UNTIL A "NO"   IN $____INCREMENTS UNTIL A "YES"

IS GIVEN. WHEN A "NO" ANSWER   ANSWER IS GIVEN. WHEN A "YES" IS

IS GIVEN, RECORD DOLLAR   GIVEN, RECORD DOLLAR AMOUNT

AMOUNT OF LAST "YES" ANSWER

$_____ (GO TO B-3.c)

c. Over the course of a year, how often do you think you (and your family)
would visit this site if the membership fee is $(DOLLAR AMOUNT GIVEN IN
B-3.a) and the daily admission fee is $(DOLLAR AMOUNT GIVEN IN B-3.b).
RECORD NUMBER OF DAYS

_____ DAYS A YEAR. (GO TO B-4)

B-4 (Alternative 1: Sustaining Membership - Annual Payment)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunity shown in CARD 5 you could purchase an annual "sustaining membership". The funds collected would not entitle the member to admission but would be used, along with admission fees, to pay the costs of providing the facilities. Without your membership and the memberships of others, the facilities shown could not be provided from admission fees alone.

a. Would you buy an annual sustaining membership in the lake (river, beach, harbor) recreation area shown in CARD 5 if it costs $(INITIAL VALUE) a year, even if you never use the facilities? CIRCLE NUMBER.

```
---------------------YES.............01
                     NO..............02------------------
|                                                       |
|                                                       |
|                                                       |
|                                                       |
IF YES, INCREASE DOLLAR AMOUNT      IF NO, DECREASE THE DOLLAR AMOUNT
IN $____ INCREMENTS UNTIL A "NO"    IN $____ INCREMENTS UNTIL A "YES"
IS GIVEN.  WHEN A "NO" ANSWER       ANSWER IS GIVEN.  WHEN A "YES" IS
IS GIVEN, RECORD DOLLAR             GIVEN, RECORD DOLLAR AMOUNT
AMOUNT OF LAST "YES" ANSWER
```

$_____ (IF ANY AMOUNT, GO TO C)

(IF ZERO DOLLARS IS FINAL AMOUNT,

GO TO B-5)

B-4 (Alternative 2: Foundation - Annual Payment)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunities shown CARD 5, you could make an annual contribution to a foundation established to pay for the recreational facilities. The funds collected would not entitle you to admission to the facilities but would be used, along with admission fees, to pay the costs of providing the facilities. Without your contribution and the contributions of others, the facilities shown could not be provided from admission fees alone.

a. Would you make an annual contribution to the foundation to provide the recreational area shown in CARD 5 if the minimum contribution is $(INITIAL VALUE) a year, even if you never use the facilities? CIRCLE NUMBER


```
                           ──────────YES............01
                                     NO.............02────────────────────
          ┊                                                        ┊
          ┊                                                        ┊
          ┊                                                        ┊
IF YES, INCREASE DOLLAR AMOUNT              IF NO, DECREASE THE DOLLAR AMOUNT
IN $____ INCREMENTS UNTIL A "NO"            IN $____ INCREMENTS UNTIL A "YES"
IS GIVEN.  WHEN A "NO" ANSWER               ANSWER IS GIVEN.  WHEN A "YES" IS
IS GIVEN, RECORD DOLLAR                     GIVEN, RECORD DOLLAR AMOUNT
AMOUNT OF LAST "YES" ANSWER
                    $_____  (IF ANY AMOUNT, GO TO C)

                             (IF ZERO DOLLARS IS FINAL AMOUNT,

                             GO TO B-5)
```

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B-4 (Alternative 3: Foundation – One-time Payment)

The previous questions were based on your use and possible future use of the recreational facilities shown in the photograph (artist's conception). Please think again about the third part of the value card, CARD 4. It may be worth something to you simply knowing that the facilities exist even if you never plan to use them. To help ensure the existence of the recreational opportunities shown CARD 5, you could make a one-time contribution to a foundation established to pay for the recreational facilities. The funds collected would not entitle you to admission to the facilities but would be used, along with admission fees, to pay the costs of providing the facilities. Without your contribution and the contributions of others, the facilities shown could not be provided from admission fees alone.

a. Would you make a one-time contribution to the foundation to provide the recreational area shown in CARD 5 if the minimum contribution is $(INITIAL VALUE) a year, even if you never use the facilities? CIRCLE NUMBER

```
-------------------YES.............01
                   NO..............02-------------------
  |                                                    |
  |                                                    |
  |                                                    |
  |                                                    |
IF YES, INCREASE DOLLAR AMOUNT        IF NO, DECREASE THE DOLLAR AMOUNT
IN $____INCREMENTS UNTIL A "NO"       IN $____INCREMENTS UNTIL A "YES"
IS GIVEN.  WHEN A "NO" ANSWER         ANSWER IS GIVEN.  WHEN A "YES" IS
IS GIVEN, RECORD DOLLAR               GIVEN, RECORD DOLLAR AMOUNT
AMOUNT OF LAST "YES" ANSWER
                $_____  (IF ANY AMOUNT, GO TO C)

                             (IF ZERO DOLLARS IS FINAL AMOUNT,

                             GO TO B-5)
```

PROTEST QUESTION

B-5

We have found in studies of this type that people have a lot of different reasons for answering as they do. Which of the following statements best describes your reasons for answering the way you did? READ OFF ALL REASONS AND REPEAT IF NECESSARY. CIRCLE NUMBER

NOT ENOUGH INFORMATION.........................01

DID NOT WANT TO PLACE DOLLAR VALUE...........02

OBJECTED TO WAY QUESTION WAS PRESENTED.......03

THAT IS WHAT IT IS WORTH TO ME...............04

OTHER (SPECIFY)..............................05

(GO TO C)

PART C

BACKGROUND DATA

(See Personal Interview Direct Question Form)

Appendix B: Outline of CV Study Design

CONTINGENT VALUE SURVEY: CASE STUDY

Outline of Tasks

1. Determination of project(s) for case study

    - location
    - description

2. Delineation of study area(s)

3. Determine sampling procedure

    - select population of interest
    - method of enumeration of population of interest

4. Determine required sample size

    - estimated response rates
    - acceptable
    - precision

5. Determine questionnaire format

    - mail
    - personal interview
      - on site
      - off site

6. Identify and describe comparable recreational sites as alternatives to project

    - names
    - locations
    - recreational activities

7. Determine field interviewers

    - Corps District
    - contract

8. Prepare questionnaires

    - specific questions
    - visual aids
    - limited study area pretest??

9. Prepare data reporting forms and field manual

    - interviewer quality control forms

10. Interviewer training

11. Conduct survey

12. Validation of completed questionnaires

    - 10%

13. Keypunching

14. Data Analysis

    - profiles of respondents
    - profiles of target population
    - fitting the bid function(s)
    - estimates of willingness-to-pay
    - estimate NED benefits

Appendix C

Keyword Index (by Chapter)

Chapter IV Keywords

Chapter V Keywords

Chapter VI Keywords

Chapter VII Keywords

END

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DTIC